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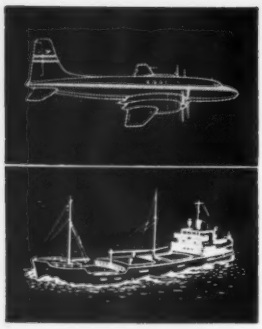

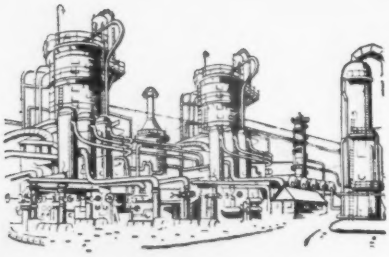

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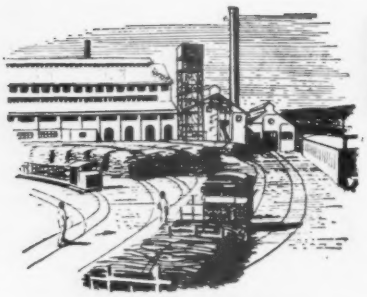

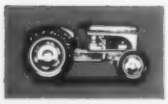

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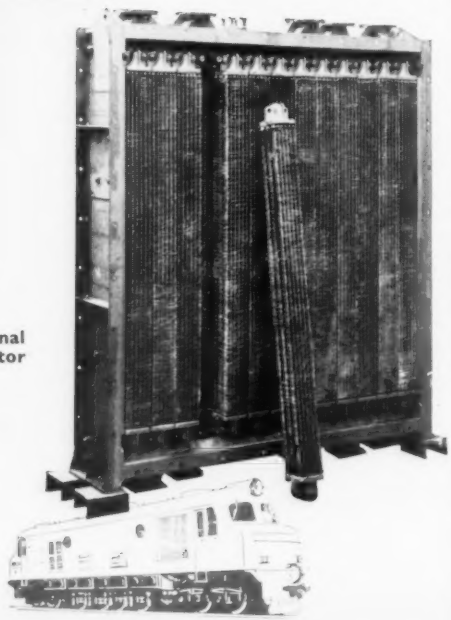

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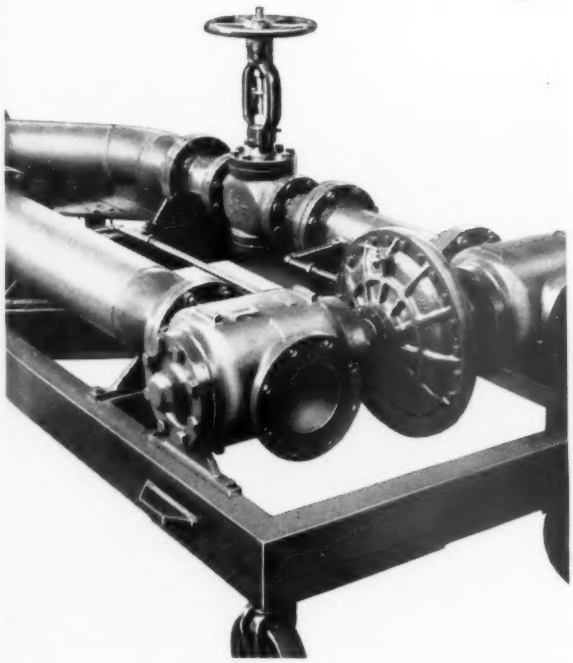

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Contents

CBMPE Mission to Canada 149

Diesel Traction and British Railways
By *J. M. Jarvis* 150

Around the Branches 157

Personal Notes 158

Notes of the Month 159

Books and Films 163

Drilling Barge for Abu Dhabi 164

Increased United Kingdom Oil Consumption ... 165

Conferences, Congresses, and Exhibitions ... 167

The Effects of the Beaver Report on Pollution 168

Middle East Pipelines 169

International Synthetic Rubber Symposium ... 170

European Equipment Manufacturers Visit Britain 171

Britain's Energy Resources 172

Petroleum in Parliament 173

Trade Literature, etc. 173

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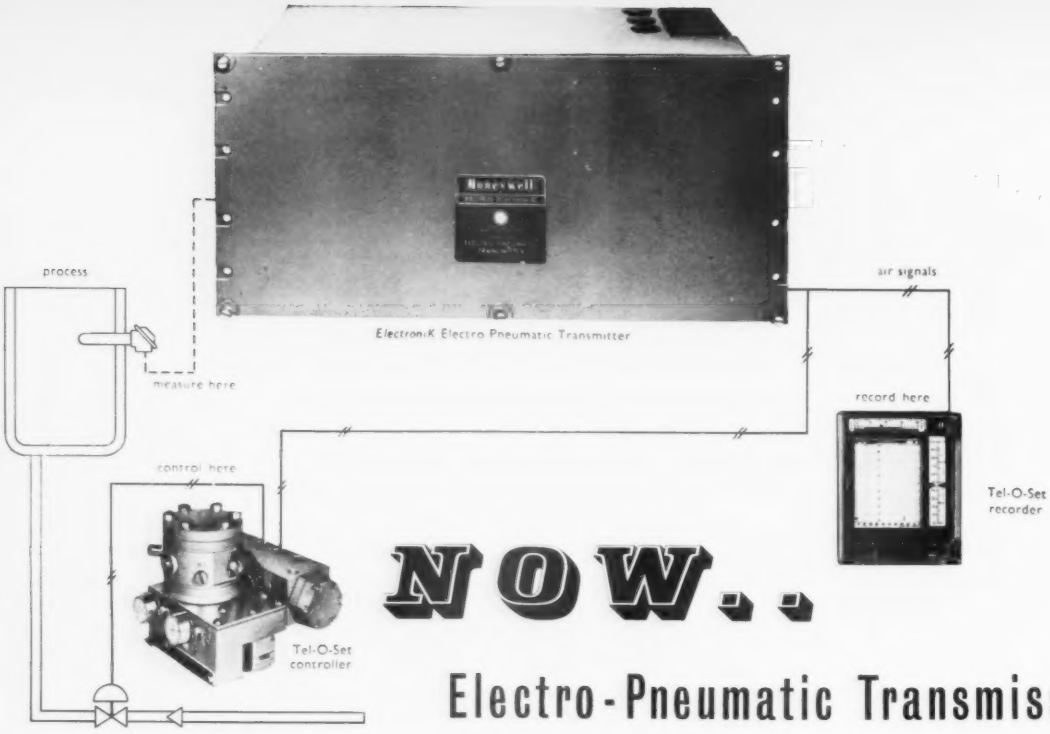

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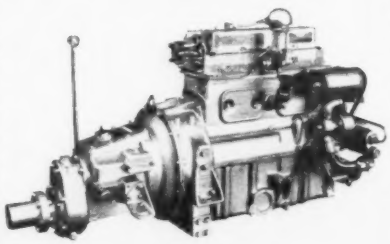

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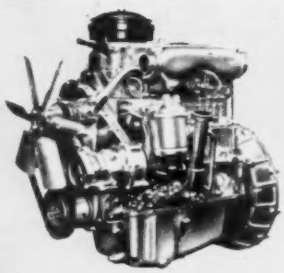

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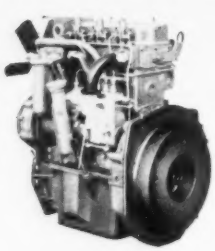

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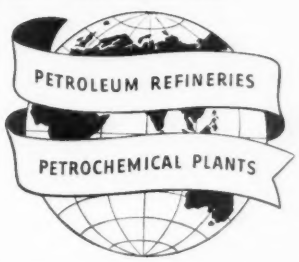

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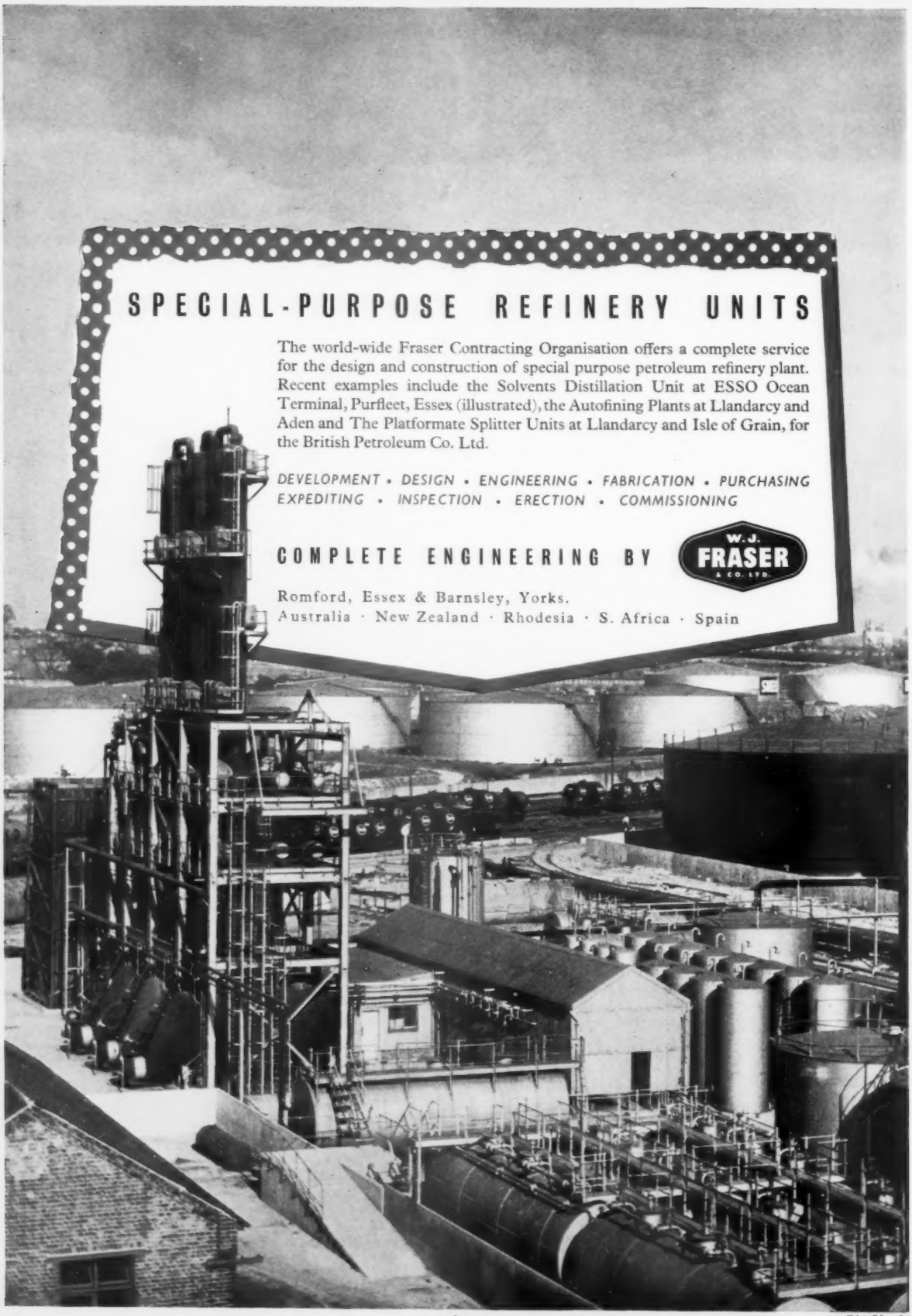
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THE INSTITUTE OF PETROLEUM

REVIEW

Volume 11, No. 126 June 1957

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CBMPE Mission to Canada

Engineering, Technical, and Goodwill

Speaking at a reception in London to the members of the CBMPE Engineering, Technical, and Goodwill Mission to Canadian Oilfields and Refineries shortly before their departure, J. M. Storey, leader of the Mission and managing director of Dewrance & Co. Ltd, stressed that, in addition to engineering, the title of the Mission was technical and goodwill. He said: "Anything that contributes towards cementing the great ties of the Commonwealth is worth doing and worth doing well. We hope that our Mission will succeed in bringing pleasure and profit to both sides of the Atlantic."

Thanking those who had gathered together to wish the Mission good luck, and speaking on behalf of the Council of British Manufacturers of Petroleum Equipment, Mr Storey said that the reason for the journey was a simple one. The oil equipment industry in Britain had grown to such a great size, keeping pace, as it must do, with the constant expansion of the oil industry, that to-day the whole of the equipment required to build a refinery could be obtained here, as well as more than 80 per cent of the drilling equipment normally used. The knowledge of this expansion must be conveyed to everybody engaged in the oil industry.

It was the Mission's business to find out whether the Canadian oil industry was aware of that great expansion. It also had to discover what were the physical conditions of doing business in Canada. In short, they were going to show their samples and try to sell them.

There had been phenomenal developments in Canada's oil industry and these had involved immense capital expenditure. This had totalled about $4200 million since 1947 and the results had been worthy of that expenditure. Crude oil output in Canada in 1955 was nearly double that of 1954, but that was not much more than a beginning, said Mr Storey.

As a trading nation, Britain could not ignore the situation and they must do what the British oil companies were always exhorting them to do—go and see for themselves and adapt themselves to the market as they found it. They were going, and Mr Storey was sure that in Canada they would learn sufficient to be able to supply the British equipment that great Dominion required. They would start their tour at Montreal on 25 May, he said, and travel via Ottawa, Toronto, Sarnia, Winnipeg, Regina, Calgary, and Edmonton to Vancouver, where they were due on 19 June. A report would be issued on their return to the United Kingdom.

T. M. Burns, Commercial Secretary, Office of the High Commissioner for Canada, said he was sure the Mission would receive the warmest welcome from every Canadian they met. He had been very interested in the plans of the Council for the Mission. The growth of the Canadian petroleum industry had only been made possible by the supply of many types of equipment from abroad, much of which had come from the United States.

Mr Burns believed that the Mission would result in a greater awareness in Canada of the high standards and scope of the United Kingdom petroleum equipment industry. He was convinced that the report of the Mission would encourage many British firms to tackle the Canadian market, which was a highly competitive one. With its rapidly developing petroleum industry, Canada offered challenging prospects and he was sure that the members of the Council would accept that challenge and share in the rewards.

Mr Burns said he was pleased that the technical and goodwill aspects of the Mission had been emphasized. The Canadians they would meet would be glad to discuss their practical and technical problems. In turn they would be glad to receive information as to how the British equipment industry could contribute to the growth and maintenance of the Canadian petroleum industry. He concluded by assuring the Mission that they would receive a sympathetic and warm welcome in Canada.

F. J. Erroll, M.P., Parliamentary Secretary, Board of Trade, said that the Board of Trade wished the Mission all success, and he also conveyed the good wishes of Lord Mills, the Minister of Power.

Deputy Leader of the Mission is G. L. Hancock (general manager and director, David Brown Industries Ltd), and the members are:

R. J. Anderson (manager, Oil Industry Materials Department, I.C.I. Ltd, Metals Division)
A. J. Banks (director, Winn & Coales Ltd)
R. C. Bird (managing director, Petbow Ltd)
A. G. Ellison (senior metallurgist, Yorkshire Copper Works Ltd)
A. V. Flagg (managing director, Steel Equipment Co. Ltd)
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S. J. Harley (chairman and managing director, Coventry Gauge & Tool Co. Ltd)
S. W. Hoskins (director, I. V. Pressure Controllers Ltd)
A. A. Kaye (manager, Petroleum & Chemical Division, British Thomson-Houston Export Co. Ltd)
E. C. Whiteley (manager, Middle East Division and Petroleum Industries, Metropolitan-Vickers Electrical Co. Ltd)

Diesel Traction and British Railways

By **J. M. JARVIS, B.Sc., A.M.I.Mech.E., A.M.I.Loco.E.**

Mr Jarvis, a mechanical engineer on the staff of the British Transport Commission, British Railways Division, read the following paper to the London Branch on 26 September 1956.

One of the major aspects of the extensive modernization programme which British Railways have put in hand, concerns the provision of new motive power for traction. The intention is steadily to replace steam locomotives on all duties, and this will be accomplished both by extending electrification and also by making use of diesel power on a large scale for all kinds of duties. The high capital cost involved in fixed installations for the transmission and distribution of electric power limits the maximum benefits of electrification to those routes which carry considerable traffic, and for this reason an early start will be made in electrifying the busy trunk routes to the North, from Euston to Birmingham, Manchester, and Liverpool, from King's Cross to Doncaster and Leeds, and an extension of electrification of the Eastern Region Main Line from Liverpool Street to Ipswich and of the branches to Clacton, Harwich, and Felixstowe. Some 820 miles of route will be involved in these schemes, for which 25,000 volts a.c. will be employed. In addition to these routes, the existing system of 600-volt d.c. electrification on the Southern Region will be extended to cover the main routes in the South East of England, east of Portsmouth and Reading. Furthermore, electric traction will be applied on various suburban routes north and east of London out of King's Cross, Liverpool Street, and Fenchurch Street stations and also on an extensive mileage in the Glasgow area.

Steam Locomotives

In the past, the steam locomotive has served Britain well and has been an appropriate form of traction in a country which has abundant coal resources. Although the steam engine has long been criticized on account of its somewhat low thermal efficiency, it nevertheless has a number of good points and, until recently, has been able to hold its own in hauling the bulk of the world's railway traffic. The conventional steam locomotive originated in England over 125 years ago, and has been improved steadily over the years in detail, performance, and efficiency both in Britain and overseas. It has been notable for its characteristics of low first cost, simplicity, long life, and a robust constitution which enables it to perform its work in all kinds of environment. Furthermore, under conditions where good coal and manual labour were cheap and readily available it was, in overall terms, reasonably economic. Whilst numerous attempts have been made, in Britain and abroad, to radically improve the efficiency of the steam locomotive, such as by the use of ultra high steam pressures, of turbines with or without condensers, etc., almost invariably these were given up sooner or later because the advantages gained were not sufficient to offset the loss in simplicity, reliability, and low first cost inherent to the conventional steam locomotive.

Although the demise of steam has been prematurely forecast for half a century or so, the tide has now obviously turned and few countries in the world are now ordering further steam power in any quantity.

Reasons for Change in Motive Power

There are several reasons, as listed below, for the change in locomotive policy on British Railways, but as some 18,000 steam locomotives are at present in service it will naturally be a number of years before they are entirely replaced.

(1) *Coal Supplies.* Whereas before the second world war ample good quality coal was readily available at reasonable prices, it is now quite evident that there is little or no prospect of this position again applying in the U.K. in the foreseeable future. In fact, it is estimated that the demand for coal in Europe will continue to exceed local supply, notwithstanding the present prospects of atomic and nuclear power generation. Good quality coal at present consumed by the steam locomotives therefore represents a valuable export commodity.

(2) *Manpower Position.* Under conditions of virtually full employment, it is difficult and expensive to attract sufficient staff to carry out the various arduous duties connected with steam locomotives, as this work usually involves a considerable amount of shift work under conditions generally inferior to those which can be offered by many other industries.

(3) *Cleanliness.* There is now an insistent public demand for a high standard of cleanliness and reduced air pollution at a time when the limitations of the steam locomotive in this respect are further aggravated by the post-war difficulties in obtaining sufficient high-quality coal and labour.

(4) *Performance and Reliability.* Progress of diesel traction in the course of its development and application during the last twenty years has brought about great improvements to the performance and reliability both of the diesel engines themselves and of the associated transmission and control equipment. The application of these improvements is no longer to be regarded as experimental or unorthodox.

(5) *The Economic Factor.* This has been left to the last not because it is least, but so that it can be enlarged upon in detail. From the nature of its design a diesel locomotive is inevitably more expensive than a steam locomotive of corresponding power and for the U.K. a representative ratio of first costs can be taken as 3:1. However, there are

various factors listed below which can offset this disadvantage and, in many cases, result in a distinct economy.

(a) Fewer units can operate a given service due to the better utilization possible with diesel power, resulting from less time being required for servicing, fuelling, and repairs. A diesel locomotive, by virtue of its power characteristics and general design, tends to be a more versatile machine than a steam locomotive and can therefore be more readily scheduled for maximum utilization up to the limits of its "availability" for service.

(b) Fuel costs are generally reduced with diesel operation, especially for duties such as shunting, involving much intermittent work for which a steam locomotive is extravagant in fuel. On main line duties, the thermal efficiency of diesel locomotives is some three times that of conventional steam power, comparative overall efficiencies at the drawbar, when developing power, being of the order of 19 and 6 per cent respectively. On the other hand, representative fuel costs on the basis of heat content can be given approximately as coal 4d / 100,000 B.t.u., and oil 8½d / 100,000 B.t.u.; diesel oil costs 1·6d per lb as against about ½d per lb of coal delivered to the locomotive, and whilst the steam locomotive consumes more fuel during "lighting up", standby, and coasting periods, the fuel costs do not differ to the extent indicated by the thermal efficiencies. There is, however, the added advantage for diesel power that, as a much smaller quantity of fuel is consumed, less fuel has to be moved as non-revenue traffic, and furthermore the greater range obtainable on a given weight of fuel provides scope for reducing the number of fuelling points, quite apart from this operation itself being simplified.

(c) Appreciable savings should arise in day-to-day servicing and maintenance costs. The numerous facilities and associated labour required for servicing steam locomotives, such as turntables, coaling plants, water columns, track troughs, and ash disposal plants can be entirely or largely eliminated at such time as steam power is completely replaced from an area and, whilst diesel power must be given regular and methodical examination and maintenance, it should be possible to concentrate this work at a smaller number of well-equipped depots. Experience with main line diesel locomotives in the U.K. is at present too limited to show what the ultimate level of repair costs will be in respect of a large fleet of diesel units.

(d) For certain applications, such as shunting within yard limits and in the operation of multiple unit diesel trains, one-man operation in the cab has been adopted and leads to substantial savings in operating wages. The safety aspect of this practice is covered by the provision of a "deadman's" device, which automatically shuts off the power and applies the brake, if the driver relaxes his pressure on a handle or treadle for more than a very limited period.

In a paper to the Railway Students' Association in 1956, the following figures were given by Bond* to illustrate representative total costs per shunting hour for diesel to steam power:—

	3-shift day	Single 8-hr shift
Diesel	21s. 6d.	34s.
Steam	34s. 6d.	46s.

*R. C. Bond, M.I.C.E., M.I.Mech.E., chief mechanical engineer, British Transport Commission, British Railways Division.

Historical Background

Whilst it is only in the last two decades that rapid progress has been made in applying diesel traction to railway motive power, certain isolated examples of internal combustion engines fitted to very small locomotives did in fact occur as long ago as late in the nineteenth century. Little headway was, however, made until the 1920s and 1930s and even then it was very local in character.

So far as the U.K. is concerned, an interesting experiment was carried out in 1928 by the L.M.S. Railway in the form of a diesel-electric 4-car train. The power unit for this was a 500-h.p. Beardmore 8-cylinder engine which had been constructed for use in an airship. This was coupled to a generator supplying current to a motor bogie at the rear of the power car. The train could seat 297 passengers, had a tare weight of 144 tons, and could be driven from either end. After several months of trial service between Blackpool and Lytham, the train was withdrawn as the overall economics under the conditions of that time did not justify the purchase of the power equipment from the contractors.

In the early 1930s, the L.M.S. experimented with various types of diesel shunting locomotives. The first of these was No. 1831 in which a 400-h.p. Paxman engine and a Haslam & Newton hydraulic transmission were installed in a rebuilt steam locomotive frame. Whilst not too successful as a locomotive, in its later life it served as a mobile generating set. Following this, several types of locomotive were purchased from contractors having engines of about 150 h.p. and mechanical transmissions, but most of these proved insufficiently powerful and robust for general shunting duties. Then followed the prototype diesel-electric shunting locomotives of 300-350 h.p. A number of these incorporated a frame-mounted motor geared to a jackshaft which drove the wheels by means of a side rod drive, whilst others had nose-suspended motors driving through gears on to the outer axles (Figs 1 and 2). This type of locomotive proved very satisfactory and became the forerunner of the large classes of L.M.S. and B.R. diesel-electric shunting locomotives.

In this same period, the L.M.S. acquired three 4-wheeled Leyland railcars for use separately, and in 1938 these were followed by an articulated 3-car train powered by six 125-h.p. Leyland engines mounted under the floors and driving through torque convertors at the lower train speeds. The train itself was designed and built at Derby and went into experimental service between Oxford and Cambridge and later between St. Pancras and Nottingham. Unfortunately, the war interrupted these trials and the train was subsequently dismantled.

The Great Western Railway put into service some 38 railcar units between 1934 and 1940, these were fitted with A.E.C. equipment and many of them are still in service.

The London & North Eastern Railway also tried out several railcars in this period but the Southern Railway was, of course, devoting its resources to electrification.

Diesel railcars proved very suitable on a number of Irish Railways and now carry a considerable proportion of the passenger traffic there.

The war held up further progress with diesel traction on the railways in the U.K. and, in fact, a number of the existing L.M.S. Railway shunting locomotives went on active service overseas. After the war, progress with diesel traction was resumed, although somewhat slowly due to severe restrictions on capital, materials, labour, and the

Fig 1. *L.M.S. Railway* 250-*h.p. diesel-electric shunting locomotive, No.* 7058. *Delivered by Armstrong-Whitworth in* 1934.

overriding necessity to rehabilitate the system quickly without involving delay for extensive experiments and development. Details of the post-war diesel policy are given later in this paper.

In other countries, the replacement of steam has been occurring to a greater or lesser extent on the majority of railways. Nowhere has this been more spectacular than in the U.S.A., where the steam locomotive is well on the way to becoming merely a museum piece! Apart from the resources which permit such a rapid changeover, the operating characteristics of that continent, involving long hauls of very heavy trains, particularly favour the use of diesel locomotives. It is regular practice to work some four locomotive units in multiple under the control of a single crew. These locomotives can remain on the train for a thousand or more miles and require a minimum of delay for servicing and fuelling.

Fig 3 shows graphically how the number of diesel locomotives had risen in North America between 1930 and 1953

Fig 2. *L.M.S. Railway* 300-*h.p. diesel-electric shunting locomotive, No.* 7079. *Built by English Electric Co. in conjunction with Hawthorn-Leslie,* 1934.

at the expense of steam, which in the same period had declined from some 60,000 to under 15,000 and has subsequently fallen much lower still to only several thousand.

Fig 3 also indicates the corresponding position for Western Europe, excluding Britain and Western Germany. In this case, there has been a considerable expansion of electric traction as well.

For either continent it will be noted that there has been an appreciable decline in the total number of units. This can be attributed to several reasons as follows:—

(a) More intensive utilization of the units.
(b) General increase in the power of individual units.
(c) Reduction in local and branch line traffic as a result of rival forms of transport.

Application of Diesel Power

In applying any type of equipment successfully to rail vehicles it is essential to ensure that it is robust, reliable, and suitably mounted. This is necessary because railborne accessories are subjected to considerably more severe treatment than is usually met with on stationary and marine applications, and experience has often demonstrated that a particular item which hitherto has given good service on other applications is not quite "man enough" in its existing form when fitted to a locomotive or rail vehicle. Another factor to be considered in this connexion is that since rolling stock travels about over wide areas and in consequence has to be handled and serviced by a large number of staff, it is important that requirements for attention and maintenance should be kept to an absolute minimum. For this reason, it is also desirable to achieve as much standardization of equipment as is compatible with progress and development.

These considerations, of course, apply just as strongly in the case of diesel engines, transmissions, and all their associated equipment, and the contractors concerned in supplying these for rail applications generally pay very special attention to design, installation, and rating in such cases. At times of changeover like the present, it is most desirable that close liaison should be maintained between the railway and the manufacturers of the equipment.

At the present time, the standardization requirements have been somewhat relaxed to enable full scope to be given to manufacturers to submit and prove their own developments. Even so, a considerable degree of control and caution based on long experience is still necessary on account of the continuing responsibility for the safety of all who use or work upon the railway, together with the fact that rolling stock once purchased must be lived with day in and day out for many years, as the prospect of economic disposal is very remote.

Since diesel engines can be controlled remotely by means of magnetic or pneumatic controls, considerable scope is offered to the railway engineer in applying this type of power to a train, and it can be done in either of two main ways:—

(1) The power equipment can be concentrated in distinct locomotives and provision is often made so that two or more of these can be coupled together in multiple and operated by a single crew. This feature has the great advantage that the same units may be used in this manner for working heavy trains on the main lines and at other times singly on lighter trains or for duties on branch lines which, from a civil engineering aspect, cannot accept a larger or heavier locomotive. It is therefore possible to

adopt a size of locomotive which has an extensive route availability and which may be used on a wide range of duties, and can consequently be worked intensively for a maximum proportion of the time. This permits a reduction both in the total number of locomotives and in the number of different types required.

(2) The other way of using diesel power on passenger trains is to distribute smaller size engines amongst different vehicles in the train, either placing the equipment in separate compartments or mounting it on the underframe beneath floor level. The latter method has the advantage of allowing almost the entire length of the train to be used for revenue earning purposes. These trains, normally referred to as multiple unit trains, have a driving compartment at each end from either of which all the power equipments can be controlled simultaneously. This system eliminates "light engine" movements and shunting at terminals, and is of great assistance for operating intensive services.

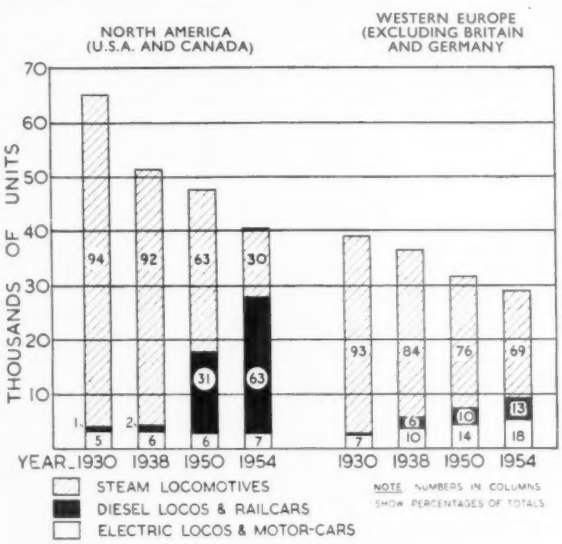


Fig 3.

There are three main types of traffic, all of which can be effectively handled by diesel motive power, as follows:—

(a) Shunting, both passenger and freight.
(b) Trip working of interchange and local freight services.
(c) Main and branch line services, both passenger and freight.

Separate locomotives are called for in the case of the first two of these, but for passenger trains alternative use may be made of self-propelled trains, providing the traffic is within their capacity. The choice depends largely upon economic factors, as unless a high degree of utilization can be obtained with self-propelled trains, it is likely that separate locomotives, which may also be used on freight and other duties, become the more economical proposition.

Regarding the diesel engines themselves; there is a vast range of different types, makes, power, and sizes available. A number of factors have to be carefully considered when making a choice of these and include fuel consumption both at full and part load, specific weight, size, shape, and, a most important point, good reliability and a minimum of maintenance requirements. Selection is somewhat complicated by the conflicting nature of the various factors, so that the best course is not always obvious and calls for a certain amount of compromise which can only be fully confirmed by actual experience. It is for this reason that widely different types of engine are extensively and satisfactorily used for various applications and by different administrations. Typical contrasts in practice are: 2-stroke *v.* 4-stroke; supercharged *v.* naturally aspirated; heavy and robust slow-speed engines *v.* lightweight high-speed engines. Some of these characteristics have such a distinct advantage for particular applications that any associated drawbacks are largely outweighed, giving rise to a choice that is obvious. In other cases, the ideal selection is less clear cut, and depends mainly on local conditions and preferences. In any event, the particular type of engine adopted tends to be interdependent to a greater or lesser extent on the actual servicing and maintenance procedures employed and may furthermore have some influence on lubricating procedures.

For main line railway traction where the mass of power unit and the train has to be accelerated to high speeds, and operated over undulating routes, excessive weight is an expensive item from the point of view of fuel costs, due to the effects of inertia and gravity. For this reason, there is a definite world-wide trend towards the light-weight higher speed, highly supercharged engine for this type of duty; the ultimate in this direction at present being represented by the famous Napier Deltic engines as fitted in an experimental 3300-h.p. single-unit locomotive, weighing only 106 tons, built by the English Electric Company, and now undergoing trials on the L.M. Region of British Railways. Considerable experience will, however, be necessary to determine how far such weight saving may be usefully pursued before its advantages are more than offset by reduced reliability and higher maintenance costs.

Transmissions

A feature which greatly contributes to the simplicity of the steam locomotive is that the pistons can be directly coupled by means of connecting rods to the cranks on the driving wheels or axle, but this arrangement is not possible in the case of the internal combustion engine because the characteristics of this type of prime mover preclude starting from rest under load and developing reasonable power at low crankshaft revolutions. Consequently, some form of transmission having a variable speed ratio must be installed between the diesel engine and the locomotive wheels, so that the engine itself may run in its proper speed range irrespective of the train speed.

The ideal transmission system would maintain a more or less uniform output of torque, speed, and power from the diesel engine for a given setting of the main controller handle, so that neglecting any slight changes in the transmission efficiency over the range, the horsepower at the rail would also stay virtually constant. This would provide a hyperbolic relationship between tractive effort at the rail and train speed, the former having a very high value at low speeds but falling off rapidly as the speed increases. A different setting of the main controller would produce another tractive effort speed curve of generally the same form but having a different level of values.

In practice, such a type of characteristic is often more or less closely achieved on main line diesel locomotives, whatever the type of transmission, but in the case of shunting locomotives some concession in this ideal form is

usually made for the sake of simplicity in control apparatus. The exceptionally high tractive efforts theoretically obtainable at very low speeds with diesel locomotives are in practice somewhat restricted by the limits of adhesion between the wheels and the rail, and also by the thermal capacity of the transmission when the effort has to be maintained over any appreciable period of time.

It is also necessary to incorporate suitable governor and control equipment to operate in conjunction with the diesel engine and transmission so as to automatically regulate engine output and crankshaft revolutions for each controller setting and to prevent overloading of the engine in any circumstance.

Three main types of transmission are widely used for diesel traction, either separately or in some cases in combination as follows:

(1) Electric. (2) Hydraulic. (3) Mechanical.

Electric Transmission

At the present time, electric transmission, in which the diesel engine is coupled to an electric generator which, in turn, supplies current to the traction motor or motors, is the most generally used type, especially for medium and high power applications. It has the advantage of readily providing any required speed ratio, and enables power to be conveniently distributed to wherever it is required to drive the wheels. Furthermore, the generator provides a useful means of starting the engine, for which function it acts as a motor drawing current from the batteries. Electric transmission is able to give a very desirable smooth tractive effort speed curve, as shown by the chain dotted curve in Fig 4.

Hydraulic Transmission

An alternative form of transmission, which is fairly extensively used on all sizes of locomotive, especially in Germany where it has been largely developed, is the hydraulic type consisting of torque converters and fluid couplings used either separately or in combination. This type too can provide a reasonably smooth tractive effort-speed curve as illustrated by the dotted line (Fig 4) representing a typical shunting locomotive. This transmission has an efficiency generally comparable to that of electric transmission and holds out some promise of reduced weight and first cost.

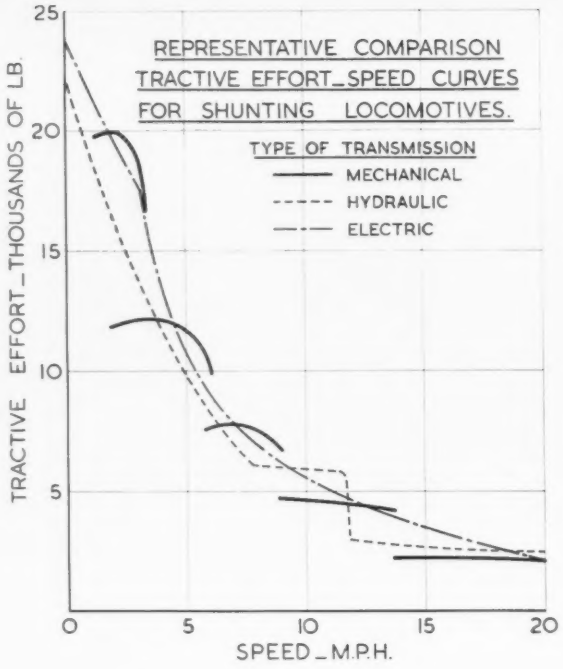


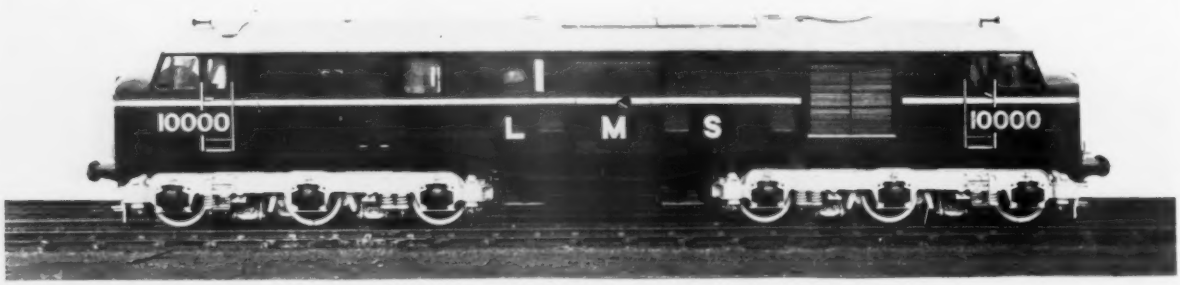
Fig 4.

Mechanical Transmission

Mechanical transmission, consisting of a gearbox, clutches, and couplings, is used extensively mainly for powers well below 500 h.p., but in applications above this value has not as yet met with much success. It is relatively simple and inexpensive and has a high transmission efficiency, but usually suffers from the drawback that the tractive effort curve is discontinuous on account of gear changing.

British Railways have in service or on order diesel applications of various powers incorporating each of the above three types of transmission, which will enable an assessment to be made in due course of the true merits of

Fig 5. *L.M.S. Railway* 1600-*h.p. main line diesel-electric locomotive, No.* 10,000. *Built by the L.M.S. Railway in* 1947, *with equipment supplied by the English Electric Co.*



each. Here again, it may well prove that one arrangement is more appropriate for a particular type of application or power range than for another.

Fig 6. British Railways diesel multiple-unit train for suburban and cross-country services. Built at Derby in 1954.

Recent and Current Development of Diesel Traction on British Railways

After the war, apart from placing orders for diesel shunting locomotives, several of the former railway companies devoted some attention to main line diesel locomotives. The L.M.S. put in hand the construction of two 1600-h.p. diesel-electric locomotives, Nos. 10,000 and 10,001, fitted with English Electric Company's equipment. The first of these (Fig 5) was completed at the close of 1947 just prior to nationalization, representing a remarkable achievement in prompt design and construction. Following these two units, an 830-h.p. diesel-electric mixed traffic locomotive, No. 10,800, was constructed by the North British Locomotive Co, and this carries a Paxman engine and B.T.H. electrical equipment.

A particularly interesting project at that time was the "Fell" locomotive No. 10,100, equipped with four Paxman 510-h.p. engines driving through fluid couplings into a differential type of gearbox whose output is transmitted through quill drives to the two centre axles of the locomotive. This novel arrangement, developed by Col. Fell, has two main features, namely separate engine-driven blowers supplying a very high supercharge to the main engines at low crankshaft speeds and the method of progressively "cutting-in" each engine to feed power into the gearbox as the locomotive speed increases.

Three further large main line diesel-electric locomotives, Nos. 10,201-3, were designed and built by the Southern Region. Whilst these, also, carry English Electric Company equipment, in this case the rating has been increased to 1750 h.p. for the first two locomotives and to 2000 h.p. for No. 10,203.

In the Spring of 1954, the first of new multiple diesel trains was completed at Derby (Fig 6), and this has been followed by very extensive orders for these trains to be built both by the railway shops and by contractors. There are now some 300 vehicles of these trains in service in different parts of Britain. The majority of the motor cars are powered by pairs of B.U.T. under-floor engines, each of 150 h.p., driving through epicyclic gearboxes and cardan shafts to final drives on the inner axles. Under the modernization plan, a total of some 4600 vehicles in such trains will be provided to replace steam trains on various types of passenger service throughout Britain.

Rapid progress is being made in replacing steam by diesel power for shunting duties and already some 500 diesel locomotives are in service and will be augmented by a further 400 in the next two years. Most of these are of 350 h.p. and have electric transmission (Fig 7), whilst the remainder are of 200 or 150 h.p. fitted with various types of mechanical and hydraulic transmission. A further 1200 diesel shunting locomotives are proposed under the modernization plan.

Orders have now been placed for 160 main line diesel-electric locomotives of several types with powers ranging from 800 to 2300 h.p., together with 14 diesel locomotives having hydraulic or hydro-mechanical transmissions. These locomotives will be supplied by various contractors and railway works within the next year or two, and will enable British Railways to carry out a large-scale trial of diesel traction on the main lines.

Special Provisions for Dealing with Diesel Power

Whilst the Railways already possess a comprehensive organization with workshop facilities which in the past has proved so satisfactory in dealing with steam power, and which broadly can be suitably adapted to provide equally well for the new forms of traction, it is however necessary to introduce many completely new methods for operating, servicing, and maintaining diesel power if the best use is

Fig 7. British Railways 350-*h.p. diesel-electric shunting locomotive, No.* 13005.

to made of it. This, in its turn, calls for extensive training of the various grades of staff concerned. To enable this to be accomplished the following facilities are already in existence.

A diesel traction instruction centre has been set up at Derby for training large numbers of various levels of administrative and technical staff in the Chief Mechanical and Electrical Engineer's and the Motive Power Departments over the whole system.

The Motive Power Department also runs schools for instructing its driving and maintenance staffs and in addition possesses several mobile instruction trains which tour the various depots in each region, providing "refresher" instruction to the men on their "home" ground. These schools and trains are each under the charge of a competent instructor and are well equipped with demonstration models and items of equipment for indicating clearly their functions and correct operation, together with projection apparatus for showing cine-films, lantern slides, etc. All incoming apprentices for the main works spend an initial period in an apprentice training school at which they are given both theoretical instruction and practical training in their particular craft. This scheme ensures that the youths receive a sound introductory grounding before they enter the main workshops for their regular apprenticeship.

Another facility being provided in connexion with diesel power is a locomotive development unit. The function of this will be to correlate and analyse data collected from the various departments concerned relating to the performance, economics, and associated aspects of diesel traction, such as lubrication policies etc. This method will provide a better uniformity of analysis for the whole system and more vigorous investigation than would be possible by having the work carried out by local officers already extensively committed on their normal duties.

In addition to these staff developments, corresponding plant improvements are being made to suit the different nature and arrangement of equipment on diesel units as compared to steam locomotives. Already several new motive power depots have been provided, and these have a new arrangement of pits and platforms at three levels, specially suited to the new stock, and permit a much higher standard of cleanliness than is possible in steam locomotive running sheds.

In respect of major overhauls, a fully equipped diesel locomotive and engine repair shop attached to one of the main locomotive works has been functioning for a number of years, both in overhauling existing locomotives and in constructing mechanical parts and erecting new locomotives. Similar facilities are being introduced at other centres to meet the rapidly increasing demands caused by the introduction of further diesel units. British Railways already possess unrivalled facilities for testing locomotives and trains, and these will be expanded and modified as necessary for dealing with diesel traction.

Conclusion

From the foregoing, it will be seen that British Railways are undertaking a most extensive reorganization of their equipment and methods, and this provides a great challenge both to those inside the industry and to many outside of it.

The programme will, of course, take a number of years to carry out to completion, and various adjustments to the policy may become necessary in the light of experience gained as the plan proceeds. There will, in any event, be ample developments to engage the attention of all those interested in railways for many years to come.

Acknowledgements

The author wishes to thank the British Transport Commission and R. C. Bond, chief mechanical engineer (Railways Division), for permission to present this paper and to make use of information quoted therein.

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Dr Rossini to Address IP

Dr F. D. Rossini, who is visiting Europe during the early summer, has agreed to address the Institute on 9 July at 4.30 p.m. The subject of his talk will be "Hydrocarbons from Petroleum".

Following a brief, historical introduction on the finding and recovery of petroleum, he will describe the work of the API Research Project 6, which is now in its thirtieth year in the Petroleum Research Laboratory at the Carnegie Institute of Technology. This project is engaged in the fractionation and isolation of hydrocarbons from petroleum, the development and operation of fractionating processes of high separating power, and the purification, purity, and properties of hydrocarbons.

Dr Rossini has indicated that he will be prepared to answer any points raised in discussion after his address. Full details of the meeting will be issued in due course.

Dr Rossini is probably best known for his work at the U.S. National Bureau of Standards, which he first joined in 1928 as a physical chemist in the thermochemical laboratory under the late E. W. Washburn. From 1936 until 1950 he was chief of the thermochemistry and hydrocarbons section at the NBS and in July 1950 joined the Carnegie Institute of Technology as Silliman Professor and Head of The Department of Chemistry. Here he is also director of the Petroleum Research Laboratory, the work of which includes API Project 6 on Analysis, Purification, and Properties of Petroleum Hydrocarbons, and Project 44 on Data on Hydrocarbons and Related Compounds. The API Data and Samples office is also under his care.

Petroleum chemistry and chemical thermodynamics have always been subjects of deep interest to Dr Rossini and he has been the author or co-author of more than 170 scientific papers and seven books on these and associated matters. He has held offices in numerous scientific bodies, among them the chairmanship of the ACS Petroleum Division (1954), and chairman of IUPAC Commission on Chemical Thermodynamics (1957).

In 1948 Dr Rossini was made an Honorary D.Sc. of the Carnegie Institute, in 1954 he was awarded the Gold Medal Exceptional Service Award of the U.S. Department of Commerce, and in 1955 he was given the honorary degree of Doctor of Engineering Science of the Duquesne University.

Around the Branches

BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD

The March meeting of the IP Branches Committee was held at the headquarters of the Scottish Branch. Members of the Committee are here seen at Grangemouth.

Essex Branch

At a meeting of the Branch on 12 April, when over 100 members were present, A. C. Hartley, C.B.E., a vice-president of the Institute, talked on the operation of PLUTO, the underwater pipelines which were laid during the war from the U.K. to Cherbourg and to Dunkirk. Mr Hartley, who was closely concerned with the design of one of these lines, gave an interesting talk and in a lively discussion which followed the paper, W. Kohring paid tribute to Mr Hartley's part in the project.

After a short interval following the paper and discussion a film show under the general heading of "Transport by Tanker" was given. The two films shown were *We've Come a Long Way* (The British Petroleum Company) and *Proud Ships* (Shell Petroleum Company).

This meeting concludes the present session of the Branch but works visits are being organized and a buffet dance will take place at the Queens Hotel, Westcliff-on-Sea, on 21 June.

Scottish Branch

A meeting of the Branch was held in the Recreation Hall, BP Refinery (Grangemouth) Ltd, on 11 April, when Dr G. H. Smith, M.C. (Hon. Treasurer), who was in the chair, introduced H. E. F. Pracy (Branches lecturer) who presented his paper on "The Place of the Chemical Engineer in the Petroleum Refining Industry".

After the presentation of the paper a lively discussion ensued. Finally, on the call of the chairman, Mr Pracy was accorded a vote of thanks.

South-Eastern Branch

A meeting was held at the King's Head Hotel, Rochester, on 2 April, when R. Leach (Shell-Mex and BP Ltd) gave a most interesting and humorous talk on the use of films in the oil industry. In the course of his lecture, Mr Leach explained to the fifty members and friends present the painstaking and intricate detail work which is necessary for even a "short" film advertisement, such as that broadcast by the ITV. He also gave details of how the cost of 30*s* to £18 per foot of finished film was made up.

The many small film companies of Britain, he said, are producing some 500 films per year on a variety of subjects for internal use, employees' training, and public display involving live actors, cartoons or puppets, or a combination of all. His lecture, which was illustrated with specimen films, gave all present a good insight into the back-stage work of film production.

OIL IS WHERE YOU FIND IT—OR WILD "DOGGING"

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Personal Notes

J. W. Platt, M.A., F.Inst.Pet., a managing director of The Shell Petroleum Comany Ltd, and a principal director of N.V. De Bataafsche Petroleum Mij, the two parent operating companies of the Royal Dutch Shell Group, has decided to retire from these offices with effect from the end of June 1957, prior to which date he will have reached the age of 60. His decision has been accepted with regret. He will remain a director of The "Shell" Transport and Trading Company Ltd and a director of The Shell Petroleum Company Ltd.

Photograph by Walter Bird

J. W. Platt.

J. P. Berkin, C.B.E., M.Inst.Pet., was on 11 April appointed a director of The "Shell" Transport & Trading Company Ltd. Additionally, he has been appointed, with effect from 1 July 1957, a managing director of The Shell Petroleum Company Ltd and a principal director of N. V. De Bataafsche Petroleum Mij. Mr Berkin has been a member of the Board of The Shell Petroleum Company Ltd since 12 November 1953.

Photograph by Walter Bird

J. P. Berkin, C.B.E.

S. Lumb, has been appointed Northern Area sales manager of Rocol Ltd, a newly-created post and area in the organization and one which places him in charge of all Rocol and Ragosine Oil Company representatives in the North of England.

J. Dummelow, M.A., A.M.I.E.E., has been appointed assistant manager, Publicity Department, of Metropolitan-Vickers Electrical Co Ltd. Since 1946 and prior to his new appointment, Mr Dummelow has been editor of the *M-V Gazette* and Press Officer. He is a member of the British Association of Industrial Editors and a Freeman of the City of London, being Renter Warden of the Wax Chandlers Company.

Dr A. J. Good, who has for the past four and a half years been managing director of E. B. Badger & Sons Ltd, has rejoined the Company's American affiliate, Stone & Webster Engineering Corporation of Boston, Massachusetts. Dr Good has been succeeded as managing director by **K. Finsterbusch,** who is also a director and vice-president of the Stone & Webster organization, with whom he has been associated for the past seventeen years.

T. C. Richardson, who was appointed divisional sales manager last year, has succeeded **A. W. Hardie** as divisional manager, Eastern Division, Shell-Mex and B.P. Ltd. Mr Hardie, who became divisional manager in 1953, has been appointed general manager, Scottish Oils and Shell-Mex Ltd.

A. Peck, who has for a number of years been divisional manager in Cardiff, has been appointed manager of Mobil Oil Company's Consumer Fuels Sales Department—a new department formed to co-ordinate the Company's sales activities in the consumer fuels market.

A. Peck

G. F. Towers, a member of the Canadian Committee of the Hudson's Bay Company, is to become chairman of BP (Canada) Ltd, which, as reported in these columns in April, p. 108, is entering the petroleum products market in Eastern Canada and is planning the construction of a refinery in the Montreal area. From 1934 to 1954 Mr Towers served as Governor of the Bank of Canada. During this period, he also served as chairman of the National War Finance Committee; president of the Industrial Development Bank; and alternate governor, International Monetary Fund. Mr Towers includes in his directorships the Canada Life Assurance Company, Canadian Investment Fund Ltd, and Bell Telephone Co. Ltd.

J. Murphy, A.A.C.C.A., formerly assistant manager (commercial) in the Kerosine and Agricultural Dept at Shell-Mex and B.P.'s Head Office in London, has been appointed divisional accountant for the Northern Irish Division of the Company. Mr Murphy has been succeeded by **C. A. Pink,** who has, since September 1954, been retail marketing manager in the London Division of the Company.

Eric Mensforth, C.B.E., M.A., M.I.Mech.E., F.R.Ae.S., M.I.P.E., has been appointed a director of Costain-John Brown Ltd.

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MIDDLE EAST PRODUCTION

	Tons	
	March	*Jan.-Apr.*
Iraq Petroleum Co Ltd	570,670	783,739
Basrah Petroleum Co Ltd ...	689,894	2,103,763
Mosul Petroleum Co Ltd ...	24,324	24,448
Qatar Petroleum Co Ltd* ...	486,056	1,435,983
Iraanse Aardolie Exploratie en Productie Mij	2,588,000	8,003,000

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for March was 1,353,000 tons, the total for 1957 being 4,146,000 tons.

*The Company announces that the production figure for February has been amended. The figure should read 451,227 tons, and and not 451,219 tons (see *IP Review*, 1957, **11,** 138).

Notes of the Month

Salary Scales for Chemists

The British Association of Chemists has recently issued a recommended scale of minimum salaries for chemists and chemical assistants. The grades covered are from junior laboratory assistants to senior chemists and the recommendations include notes regarding qualifications, increments, etc. Copies are available from the BAC, 14 Harley Street, London, W.1.

New High Level of Oil Production

In a statement made on 26 April, Standard Oil Company (New Jersey) said that, despite dislocation in world supply caused by the blockage of the Suez Canal and consequent gasoline rationing in some European countries during the winter, free-world consumption was higher in the first quarter of 1957 than in the same period of 1956. Gross crude oil production world-wide was 2,405,000 barrels per day as compared with 2,300,000 barrels per day in January-March 1955.

N.Z. Storage Installation

New storage facilities for motor spirit and gas oil have recently been commissioned by BP (New Zealand) Ltd. Situated at Tauranga Bay on the east coast of North Island, about four miles from Tauranga town and harbour, the installation includes a jetty, which can take ocean-going tankers alongside, and a tank farm. The name of Mount Maunganui, the extinct volcano which lies close to Tauranga Bay, has been adopted for the installation.

The first BP tanker to discharge at the new installation was the 12,000-dw ton *British Union*, which loaded at BP's Kwinana refinery on 7 April and arrived at Mount Maunganui on 25 April with a cargo of motor spirit and gas oil.

New Deep Test Well in Sicily

After intensive geological and geophysical surveys, BP's exploration subsidiary in Sicily is preparing to drill a deep test well at Troitta, near Caltagirone, whither a drilling rig has been sent from the United Kingdom. The well will be known as Troitta No. 1.

BP's first test well in S.E. Sicily—drilled near Vittoria in 1953-54—found some crude oil but of very heavy specific gravity. Although no commercial outlet has yet been found for this oil, a prolonged production test is being planned in the hope that its further development can be undertaken to contribute to the supply of bitumen needed for the extensive programme of road construction recently adopted in Italy.

Aboard the *Mayflower II*

When the *Mayflower II*, the replica of the Pilgrim Fathers' ship, sailed for the United States, she carried a gift from BP to the Governor of Massachusetts.

The gift was a copy of the Company's colour film on its world-wide search for oil, *The New Explorers*, and was enclosed in a specially made box inscribed:

> *This copy of the BP film* The New Explorers *is presented to His Excellency the Governor of the Commonwealth of Massachusetts by the British Petroleum Company. It was carried across the Atlantic Ocean on board the* Mayflower *in the year* 1957.

"Jet" Bits in Nottinghamshire

For the first time "jet" drilling bits are being used in oil exploration in the U.K. At BP's Egmanton oilfield, a rig using these bits recently drilled nearly 900 feet in one day. While this footage has on occasions been surpassed by rigs using normal bits, it represents fast drilling under U.K. conditions.

The bits are equipped with nozzles through which drilling fluid is forced at high pressure to the bottom of the hole, thereby carrying away cuttings speedily from the path of the bit. This saves drilling through these cuttings and thus reduces wear on, and changes of, the bit—with a resulting speed up of the whole operation.

A.S.E.E. Exhibition

Evidence of the growing importance of British electrical equipment in world markets is borne out by the fact that, for the first time, the electrical industry has become the largest exporter of British goods—£271 million worth last year.

Specimens of the wide range of products which contribute to this impressive figure were recently on view at the Electrical Engineers Exhibition at Earls Court. Valued at some £2 million, the equipment included geophysical instruments; insulating media, including transformer and switch oils; electronic control and photoelectric equipment; cables; dynamos, transformers, and motors; switches and control gear; recording, measuring, and indicating instruments; a new smoke alarm for industrial chimneys; oil-immersed circuit breakers, including the flameproof type; gas- and oil-operated relays for the protection of oil-cooled transformers; electric heating tapes for pipelines; electric heating jackets and mantles for fuel oil storage tanks, etc; earth continuity and bonding systems; and so on.

Member companies who had stands at the Exhibition were as follows:—

British Insulated Callender's Cables Ltd
The British Electric Co Ltd
Eversheds & Vignoles Ltd
Gulf Oil (Gt. Britain) Ltd
Honeywell-Brown Ltd
Imperial Chemical Industries Ltd
Johnson & Phillips Ltd
Lancashire Dynamo & Crypto Ltd
M. & C. Switchgear Ltd
Metropolitan-Vickers Electrical Co Ltd
A. Reyrolle & Co Ltd
Wallsall Conduits Ltd
The Yorkshire Copper Works Ltd

Amenities at BP's Kent Oil Refinery

The British Petroleum Company has recently extended the catering and other amenities at its Kent refinery, on the Isle of Grain. A new restaurant was opened in April 1956 and more recently an amenities building has been commissioned. It contains washing, changing, and locker facilities for up to a thousand employees. There are 160 washbasins and 50 shower baths.

The Central Refinery Restaurant, with its up-to-date kitchen and bakery, provides a 24-hour service, and can serve up to 2000 meals a day. Also, a mobile service sends out hot meals to those refinery process units which must be continuously manned and where ovens are provided to keep meals warm until required.

A mobile service provides tea and snacks in seven separate office buildings and also at 60 other points in the refinery.

A BP photograph

A corner of the staff dining room, with mural in background.

The Staff Dining Room has a beechwood floor and can seat 240 people at a time, meals being served on the cafeteria system. In the tiled Operatives Dining Room meals are served on the stall system and 400 can be seated at each of its two mid-day sessions.

Record Purchases of British Oil Equipment

During 1956, the Royal Dutch Shell Group of Companies ordered in the U.K. materials and equipment to the value of £58 million, breaking the previous year's record by £8 million. Of this amount, £44 million worth is for export and £14 million worth is for delivery in the U.K. to maintain and expand refineries and research establishments. Additionally many millions of pounds were spent on the construction, repair, and victualling of the Shell tanker fleet.

Representing about 40 per cent of all business placed in the U.K. by the British oil industry, these orders were widely spread over some 3500 suppliers, seven of whom received contracts topping £1 million. Business of over £100,000 in value was placed with each of a further 80 suppliers, and orders of £5000 and under were shared among as many as 2900 smaller firms.

The variety of goods regularly purchased ranges over 100,000 different items, including large pressure vessels, pencils, aeroplanes, tape recorders, linepipe and casing, and hypodermic needles. Among the special items ordered during the year were under-water television equipment, a diamond drilling bit containing over 1200 diamonds, a steel roadway to extend over half-a-mile into the China Sea to a drilling platform, and camp trailers.

New Irish Refinery

A refinery with a capacity of about 2 million tons a year of petroleum products is to be constructed, at an estimated cost of about £10 million, in the Whitegate area, County Cork, announced N. P. Briggs, chairman of the Working Committee representing The California Texas Corporation, Esso Petroleum Co Ltd, and Shell-Mex and BP Ltd.

A new company, registered in the Republic of Ireland, to own and operate the refinery is in process of formation. It is planned to produce the principal petroleum products, including motor spirit, diesel oils, and a range of industrial fuels.

Contracts for construction of the main process units and certain off-site facilities have been placed with the Lummus Co Ltd, and work is likely to begin on the site in the late summer or autumn of this year. The project is expected to be completed by the end of 1959.

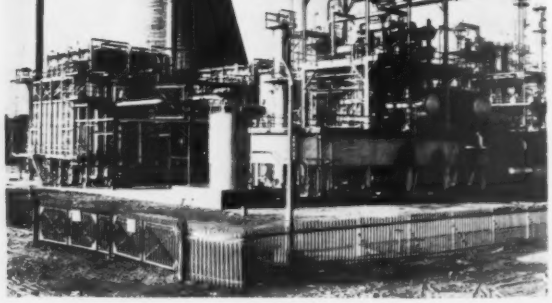
Britain's Largest Tanker goes to Sea

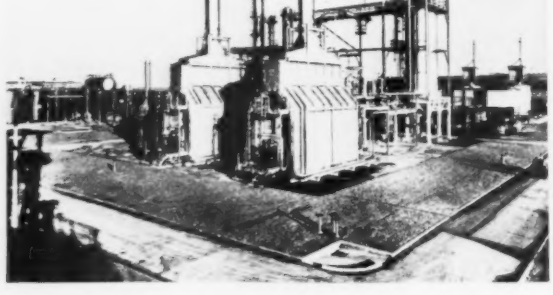
The 38,000-dw ton s.t.s. *Zaphon*, Britain's largest tanker and flagship of the Shell tanker fleet, sailed on her maiden voyage on 26 April. She was bound for the Persian Gulf to load a cargo of about 35,000 tons of crude oil for delivery to a North-West European refinery.

Built by Swan, Hunter, and Wigham Richardson Ltd at Wallsend-on-Tyne, she and her sister ship *Zenatia*, now

New Ethylene and Ethanol Plants

As announced in these columns in April (p. 107), British Hydrocarbon Chemicals Ltd has brought into operation two new plants for the production of ethylene (left) *and ethanol* (right).





nearing completion by Cammell Laird & Co Ltd at Birkenhead, have been specially designed to transit the Suez Canal fully loaded. These vessels are at present the largest tankers completed or nearing completion in the Shell fleet, for which, however, there are on order seven other larger tankers, including three of 65,000 tons dead weight.

Details of s.t.s. *Zaphon* are:—

Length o.a.	700 feet
Length b.p.	675 feet
Breadth moulded	89 feet
Depth moulded	49 feet
Summer marks draft	36 feet

At 15,000 s.h.p. her service speed will be 16½ knots. The main propelling machinery is a double-reduction steam turbine installation to Pametrada design and the boilers are Babcock & Wilcox selectable superheat type, operating with steam conditions of 600 psi at 850° F.

Syriam Refinery Inaugurated

On 23 March, the Honourable U Ba Swe, Deputy Prime Minister of Burma, inaugurated the Syriam refinery which had been reconstructed by the Burma Oil Company (1954) Ltd. In the course of his reply to an address of welcome, he said that the refinery would process 3500 barrels of crude oil daily and that, coupled with the facilities of the Chauk refinery, it would be possible now to process 6500 barrels a day in Burma. This would make the country self-sufficient in several products and there might be a slight excess of kerosine available for export.

The reconstruction work had cost only £900,000, he said, while a new refinery of the same size would have cost £3 million. The long-term aim was to process 10,000 barrels of crude oil daily and he had no doubt that Syriam would help to fulfil that aim.

On behalf of the directors, C. Maxwell-Lefroy, chairman of the Company, welcomed the Deputy Prime Minister, and also the Honourable U Raschid, Minister of Mines. At the time of the second world war, Syriam refinery was one of the largest in Asia, he said, but in 1942 was laid in ruins. In order to rebuild it as economically as possible, maximum use was made of materials on site and from two pre-war refineries at Sekkyi and Thilawa. The whole operation was an intricate jig-saw puzzle but, he continued, "Perseverance triumphed, as it always will in a worthy cause. The job has been finished and may justly be described as a masterpiece of adaptation. It is not a new refinery, in the literal sense, but we are confident that it will work just as efficiently as if it were brand new."

Mr Maxwell-Lefroy concluded by expressing thanks to all who had "rendered possible this latest notable contribution to Burma's economy."

Model of Britain's Latest Tanker Presented to Science Museum

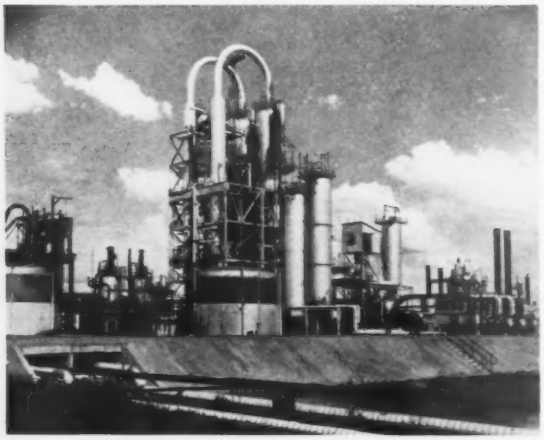
Recently, Shell Tankers Ltd presented to the Science Museum, South Kensington, London, a model of the 38,000-dw ton tanker sts *Zenatia*. The model is to the scale of three-sixteenths of an inch to a foot and measures nearly 11 feet in length.

The vessel, shortly to be completed by Cammell Laird & Co (Shipbuilders and Engineers) Ltd, and her sister ship *Zaphon*, built by Swan, Hunter, and Wigham Richardson Ltd, are the latest additions to the Shell fleet. They have been specially designed to transit the Suez Canal fully loaded, and, when commissioned, they will be the largest tankers sailing under the Red Ensign.

Each ship costs over £2¼ million, and is capable of carrying up to 35,000 tons of cargo. At a service speed of 16½ knots each can move over 300,000 tons of crude oil a year from the Persian Gulf to U.K. refineries.

Visitors to the Science Museum inspecting the tanker model.

Kellogg Synthesis Unit



This Kellogg synthesis unit in the SASOL oil-from-coal plant near Johannesburg, South Africa, is designed to treat approximately 6 million cu.ft hr of synthesis gas. Products include 3661 b.d. gasoline, 142 b.d. diesel oil, and considerable quantities of oxygenated chemicals. The complete plant is described in a recent issue of The Kellogram.

New Petroleum Chemical Plant

Foster Wheeler (London) are to employ and supervise British labour in the erection of a new petroleum chemical plant at Esso's Fawley refinery. The plant will produce synthetic rubber and plastic raw materials (ethylene, propylene, butylene, and butadiene) from 250,000 tons a year of petroleum intermediates. These basic hydrocarbon products represent a new and very substantial source of raw material for the British synthetic rubber and plastic industries.

Third Mobilgas Economy Run

The third Mobilgas Economy Run in Britain will be held from 30 August to 1 September, the fuel situation permitting. As in previous years, it will be organized by the Hants and Berks Motor Club, under R.A.C. permit, and with International status granted by the F.I.A.

The 1000-mile route will start and finish at Ascot, taking competitors through the Midlands and the North of England, including the Lake District.

The Secretary of the Meeting is H. Birkett, Hants and Berks Motor Club, 288 Fleet Road, Fleet, Hants.

U.S. PETROLEUM INDUSTRY

Preliminary figures for the United States petroleum industry in 1956 issued by the U.S. Bureau of Mines show that crude oil production reached a new record with an average daily output of 7,151,000 barrels, a gain of 5·6 per cent over the 1955 figure of 6,807,000 barrels.

Details of domestic demand extracted from the statement are set out in the accompanying table, and it will be noted that total demand, including exports, was 4·1 per cent higher than in 1955.

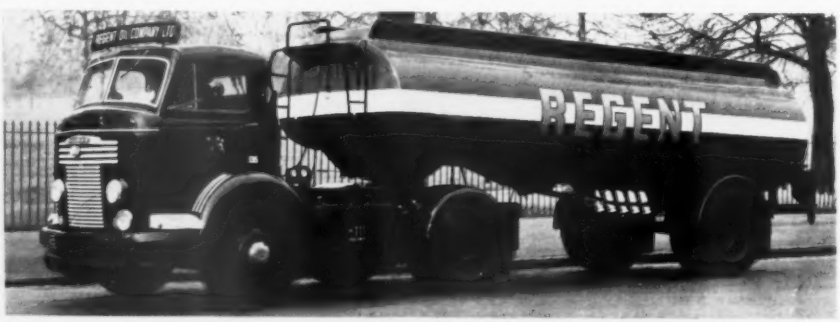
At the end of 1956 total stocks of all oils was 780,391,000 barrels or 75 days' supply. At the end of 1955 the corresponding figures were 714,859,000 barrels or 67 days' supply.

	1955	1956
	Thousand barrels	
NEW SUPPLY		
Domestic production:		
Crude petroleum	2,484,428	2,617,432
Natural gas liquids	281,371	287,652
Benzol, etc., blended	526	504
	2,766,325	2,905,588
Imports:		
Crude petroleum	285,421	341,833
Refined products	170,143	180,206
Total new supply	3,221,889	3,327,627
DEMAND		
Domestic demand:		
Gasoline	1,334,205	1,377,544
Kerosine	116,808	117,292
Distillate fuel oil	581,128	616,007
Residual fuel oil	557,057	561,691
Jet fuels	56,286	64,392
Lubricants	42,477	43,934
Wax	4,056	4,339
Coke	24,403	24,874
Asphalt	84,286	91,623
Road oil	8,356	8,086
Still gas	116,506	121,993
Liquefied gases	147,572	157,167
Miscellaneous	13,062	14,385
Losses	1,573	1,823
	3,087,775	3,205,150
Exports:		
Crude petroleum	11,571	28,414
Refined products	122,617	128,531
Total demand	3,221,963	3,362,095

★ ★ ★

Regent's Road Tankers

One of the latest additions to the Regent fleet of road tankers. With a capacity of 2400 *gallons in five compartments, it will be used for bulk delivery of either gasoline or diesel fuel. It is a Commer Scammell supplied by Rootes Ltd, the tank being made by Thompson Bros.*



Books and Films

World Motor Gasoline Survey

The 1957 edition of Associated Ethyl Company's *World Wide Survey of Motor Gasoline Quality* gives interesting data on average characteristics of motor fuels marketed in well over one hundred countries. The survey is based on information obtained during the first two months of 1957 and, in general, high and low values are given for octane number, TEL content, specific gravity, distillation, etc.

Syriam Refinery

In connexion with the recent formal opening of the new refinery at Syriam, The Burma Oil Company (1954) Ltd have issued a booklet giving a general description of the refinery and photographs taken during the final stages of construction. Reference is also made to Chauk refinery and other operations of the company.

Shell-Mex and B.P. History Told

This year Shell-Mex and B.P. Ltd celebrates its Jubilee and its history could have been written in various ways. However, the Company decided to adopt a novel method to, as C. M. Vignoles — its managing director — says in his foreword to a special publication, "recapture some of the highlights, and perhaps bring back nostalgic memories of the times in which we have lived."

The special publication, issued for the staff of Shell-Mex and B.P. Ltd, Scottish Oils and Shell-Mex Ltd, and Irish Shell Ltd, comprises 76 pages of reproductions of some of the more noteworthy advertisements used by the Company in the press. Turning the pages one is reminded of many events during the past quarter of a century. For example, the flight over Everest in 1933, the launching of the *Queen Mary* in 1934, the maiden flight of the De Havilland Comet and of the Bristol Brabazon in 1949, and so on.

On personalities, the book opens with portraits of F. L. Halford and his management team in the early years, and closes with the present-day team working under Mr Vignoles.

It is also of interest to trace the changes of style in the advertisements through the years. There was the "Crikey" series in various forms; then "Stow-on-the-Wold"; "Over the Hills"; the "Valentine", first used in 1938; the "Everywhere You Go" series, revived in 1953; and in 1954 the "Nature Studies", which were also issued as a calendar and as wallcharts for schools.

This book, apart from telling an interesting history in a unique manner, has a fascination all its own.

MAMA Bulletin

The first issue of the Bulletin of the Motor Accessories Manufacturers Association appeared on 1 April It included figures extracted from a Gallup Poll, showing the percentages of various brands of motor fuel used by motorists in December 1955 and June and December 1956.

"Lascar" Jointings and Packings

Full details of the various jointings and packings manufactured by Beldam Asbestos Co Ltd, and marketed under the trade name "Lascar" are contained in a 128-page book recently published by the company from its offices at Lascar House, Hounslow, Middlesex. Appended to the book are details of types of packing and jointing recommended for various liquids and for different temperatures and pressures. Special types of packing for various engineering applications are also listed. The book also includes a brief survey of the strainers and filters manufactured by Auto-Klean Strainers Ltd, an associated company.

Gas Turbine Prospects

Among the topics discussed in *Wiggin Nickel Alloys* No. 43, recently published by Henry Wiggin & Co Ltd, is a survey of the prospects for the use of gas turbines in merchant ships and an account of experimental work carried out to date. This magazine also contains a brief account of the history of the Rover T.3 gas-turbine car. Copies are obtainable from Henry Wiggin & Co Ltd, Publicity Department, Thames House, Millbank, London, S.W.1.

Foundation Engineering

The importance of efficient and stable foundations for modern structures and particularly for the massive and weighty units called for by the petroleum industry is a matter which demands careful attention. In the case of refineries and storage installations, the ground is frequently of a soft and possibly marshy character due to its proximity to sea or water courses. Recently, West's Piling and Construction Co. Ltd has published a useful book on *Foundation Engineering* in which the first chapter deals with soil mechanics of piling in a general way. The technical aspects of the Company's own method of piling are then discussed, and in chapter three some foundation problems are dealt with.

Finally, details are given of some of the foundations which the Company has prepared. These include work at the Esso Fawley refinery, the Thames Haven installation of London & Thames Oil Wharves Ltd, and the Isle of Grain refinery of B.P.

Copies of this book are obtainable on request from the Company's office, Bath Road, Harmondsworth, West Drayton, Middlesex.

The Deep Blue Sky

A film which traces the development of British military aircraft from the "Spitfire" to the "Victor" was recently given its première before a distinguished gathering in London. Produced by Esso Petroleum Company, this 30-minute colour film is not only a striking tribute to the British aircraft industry and to the R.A.F., but also an example of fine photography under somewhat difficult conditions.

The film includes some excellent shots of modern high-speed aircraft such as the Hunter, the Javelin, the Gnat, the Canberra, the Valiant, the Vulcan, and the Victor.

Introducing the film, J. B. Benson, manager of Esso's National Trade Division, said that the changes now taking place in Britain's national defence policy seemed to emphasize the need for a permanent record to enable present and future generations to appreciate the efforts which have made such changes possible.

There is no doubt that this purpose of the film has been achieved and it should be an inspiration to many a young man.

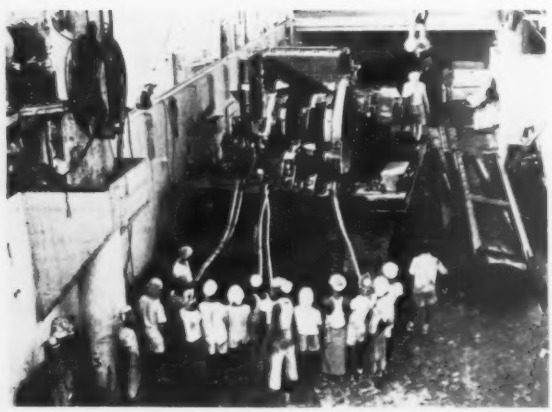
The film, in 16 mm, is available on free loan from the Aviation Department, Esso Petroleum Co Ltd, 101 Piccadilly, London, W.1.

Drilling Barge for Abu Dhabi

Adma Enterprise *afloat in the Kiel Canal after the launching.*

Launched at Audorf on the Kiel Canal on 11 April, *Adma Enterprise* is the drilling barge which will be used for the first underwater deep test to be undertaken by Abu Dhabi Marine Areas Ltd in the Persian Gulf. The barge has an area of about 200 by 100 feet and a depth of 15 feet and is able to support a complete drilling unit capable of reaching a depth of 15,000 feet. The barge will also have storage facilities for water, cement, fuel, and chemicals, a helicopter landing deck, and air-conditioned living accommodation for fifty men. When at the drilling site the barge will be supported on its four retractable legs, each of which is 10 feet in diameter and 165 feet in length.

An artist's impression of the completed barge and (below) *off-loading an excavator from a landing-craft at Das. In order to do so, the cab had to be removed and the radiator re-sited.*



The launching ceremony was performed by Mme Ornstein, wife of J. Ornstein, C.B.E., deputy-chairman and managing director of BP Benzin-und Petroleum G.m.b.H., BP's German associated company. When fitting-out and trials are completed, *Adma Enterprise* will be towed to the Persian Gulf, where, about 20 miles from the base camp on the Island of Das, drilling is due to commence early in 1958.

The well will be the first deep test well to be drilled by Abu Dhabi Marine Areas Ltd in the Persian Gulf. Its location follows several years of intensive geological and geophysical surveying of the sea bed off Abu Dhabi. The Company is owned two-thirds by The British Petroleum Company and one-third by the Compagnie Française des Pétroles.

Meanwhile good progress is being made in the construction of the base camp on Das Island, where some 500 men are at work. One breakwater for the harbour has almost reached its intended 800-foot length, and the airstrip is nearly completed. Living accommodation, stores, workshops, offices, and other buildings are also taking shape.

The stores area on Das Island.

BP Photographs

Increased United Kingdom Oil Consumption

Rise of 8·5 per cent in 1956

Despite rationing of motor fuels and restrictions on the use of other products in the latter part of the year, total consumption of petroleum products in the United Kingdom in 1956 was 8·5 per cent higher than in 1955.

Figures published by the Petroleum Information Bureau on behalf of the U.K. Petroleum Industry Advisory Committee show that, excluding bunkers for ships engaged in foreign trade, the total consumption was 25,223,049 tons.

Details from the statement are given in Table I, in which has been added the figures for the four quarters of 1956 derived from previous returns. It is of interest to note that the total consumption of motor spirit was 1·3 per cent higher than in 1955. This product accounted for 25·1 per cent of the total consumption of all products, compared with 26·9 per cent in 1955. More than half (51·6 per cent) the deliveries of motor spirit were of premium grade and were 3·7 per cent higher than in 1955. Standard grade deliveries were 1·1 per cent lower, an indication of the greater extent to which diesel vehicles are being used by commercial consumers. This is confirmed by the 12·3 per cent increase in the use of derv fuel.

The delivery of 6,471,209 tons of fuel oil represented 25·6 per cent of total consumption and was the largest quantity of any product. Despite restrictions on the use of fuel oil during December, the deliveries to the last quarter were nearly 16 per cent over the same period of 1955.

Gas/diesel oil deliveries were 10·5 per cent higher for the year and, again in spite of restrictions, the figure for the last quarter rose by 14·8 per cent.

Kerosine deliveries were in total 1·7 per cent higher than in 1955, the burning oil grade showing an increase of 20 per cent. The use of vaporizing oil, however, fell by 16·7 per cent in comparison with 1955.

End Uses

Details of end uses of certain products are set out in Tables II and III. The former covers motor fuels and kerosine, and in the case of derv fuel shows an increase of 29·2 per cent in its use by goods vehicles. Another noteworthy increase is that of burning oil for domestic purposes, a rise of 27·4 per cent. The reduction in the consumption of vaporizing oil, as mentioned above, was effective in all uses.

In the gas, diesel, and fuel oil range the total increase in 1956 consumption was 14·7 per cent, and Table III indicates that practically all consumers used more of these products. The only reductions were in the cases of stationary engines for public electricity generation and of gas manufacture.

TABLE I

UNITED KINGDOM

DELIVERIES INTO INLAND CONSUMPTION OF PETROLEUM PRODUCTS

(in tons)

	1956					1955
	Jan. to March	*April to June*	*July to Sept.*	*Oct. to Dec.*	*Total*	*Total*
Aviation fuels	415,751	434,147	494,605	409,493	1,753,996	1,697,805
Motor spirit (incl. motor benzole):						
Dealers:						
Premier grades	607,287	789,876	879,472	652,556	2,929,191	2,827,037
Standard grades	338,244	394,514	433,445	374,867	1,541,070	1,454,878
Commercial consumers:						
Premier grades	77,846	84,196	86,414	87,833	336,289	320,664
Standard grades	382,289	390,533	380,739	363,543	1,517,104	1,637,812
	1,405,666	1,659,119	1,780,070	1,478,799	6,323,654	6,240,391
Industrial spirits (incl. industrial benzole)	37,677	34,818	35,288	40,288	148,071	133,667
White spirit	36,643	41,143	37,955	39,852	155,593	149,074
Kerosine:						
Burning oil	336,746	117,794	98,597	277,671	830,808	692,234
Vaporizing oil	128,178	158,648	150,639	136,710	574,175	688,917
	464,924	276,442	249,236	414,381	1,404,983	1,381,151
Derv fuel	420,773	445,654	455,368	475,344	1,797,139	1,600,677
Gas, diesel, and fuel oils:						
Gas diesel oil	710,731	510,856	499,070	666,833	2,387,490	2,159,941
Fuel oil	1,896,032	1,440,990	1,311,636	1,822,551	6,471,209	5,384,027
Refinery consumption	549,908	542,180	548,957	516,125	2,157,170	2,060,004
	3,156,671	2,494,026	2,359,663	3,005,509	11,015,869	9,603,972
Lubricating oils and greases	208,636	225,661	215,194	245,008	894,499	888,490
Paraffin wax and scale	12,987	12,473	11,702	15,173	52,335	46,360
Propane and butane	16,605	16,773	17,985	17,032	68,395	62,871
Bitumen	191,335	277,329	246,400	225,870	940,934	865,355
Other Products	161,655	192,070	162,709	151,147	667,581	567,331
TOTAL	6,529,323	6,109,655	6,066,175	6,517,896	25,223,049	23,237,144

TABLE II

UNITED KINGDOM

ESTIMATED END USE OF CERTAIN PETROLEUM PRODUCTS

(in thousand tons)

	1956	1955
Motor spirit:		
Cars and motor cycles	3,140	3,000
Taxis	50	65
Public service vehicles	120	130
Goods vehicles	2,200	2,210
Industrial use	190	190
Agricultural use (incl. vans)	245	250
Services and other Government	325	335
Petroleum industry own use	27	27
Miscellaneous	27	33
	6,324	6,240
Derv fuel:		
Public service vehicles	845	850
Goods vehicles	907	710
Petroleum industry own use	24	22
Miscellaneous	21	19
	1,797	1,601
Burning oil:		
Farming	20	25
Industrial and railways	49	52
Services and other Government	51	57
Domestic heating, lighting, and cooking	711	558
	831	692
Vaporizing oil:		
Agricultural tractors	535	640
Agricultural stationary engines	14	17
Fishing	8	12
Industrial	17	20
	574	689

Refinery Output

Details of the output of refined products from U.K. refineries are given in Table IV, the 1956 total being an increase of nearly 4 per cent over 1955. It is noted that slightly lower figures are recorded for the light products—motor, aviation, industrial, and white spirits—and for fuel oil.

TABLE IV

UNITED KINGDOM

PRODUCTION OF PETROLEUM PRODUCTS EX IMPORTED AND INDIGENOUS CRUDE AND PROCESS OILS (incl SHALE)

(in tons)

	1956	1955
Motor and aviation spirit	6,771,195	6,874,706
Industrial spirit	2,291	2,460
White spirit	133,926	134,614
Burning oil	771,330	707,243
Vaporizing oil	98,037	95,375
Gas/diesel oil	5,188,849	4,584,549
Fuel oil	10,394,848	10,319,596
Refinery fuel consumption (ex own production)	2,130,906	2,035,365
Bitumen	933,432	851,073
Paraffin wax, scale and slack wax	19,326	18,041
Lubricating oil	776,385	706,318
Propane and butane	66,260	57,878
Miscellaneous products and loss	1,394,478	1,210,653
TOTAL	28,681,263	27,597,871

TABLE III

UNITED KINGDOM

INLAND END USE OF GAS OIL, DIESEL OIL, AND FUEL OILS

(in thousand tons)

	1956			1955
	Gas/diesel	*Fuel oil*	*Total*	*Total*
Burning:				
Central heating:				
Private	83·6	10·8	94·4	61·8
Other	178·8	902·1	1,080·9	785·9
Bakeries	24·6	82·6	107·2	95·8
Glass	28·6	233·1	261·7	240·3
Ceramics	10·4	79·4	89·8	67·2
Steel:				
Open hearth	0·5	1,066·5	1,067·0	1,018·8
Other	67·8	538·0	605·8	549·9
Industrial furnaces:				
Metallurgical	56·9	319·1	376·0	357·1
Other	74·4	201·0	275·4	266·6
Agricultural driers	36·1	36·6	72·7	56·1
Steam raising:				
Public electricity	10·7	347·9	358·6	176·5
Other	46·2	1,779·9	1,826·1	1,410·6
Power:				
Agricultural units	359·5	0·7	360·2	268·9
Marine craft	185·0	605·1	790·1	701·0
Rail traction:				
Railways	18·2	—	18·2	16·7
Industrial	21·5	—	21·5	21·0
Stationary engines:				
Public electricity	43·0	17·7	60·7	64·9
Other	322·0	5·4	327·4	303·4
Mobile diesels	330·9	15·2	346·1	315·9
Manufacture:				
Gas making	433·7	28·9	462·6	535·8
Other	34·0	48·7	82·7	65·1
Refineries*	—	2,157·2	2,157·2	2,060·0
Petroleum industry	21·0	152·5	173·5	164·6
TOTAL	2,387·4	8,628·4	11,015·8	9,603·9

*Including ex own production.

In Table V information is given of the quantities of indigenous motor fuels produced from coal products and distributed by the petroleum industry.

Consumption in Scotland

Oil consumption in Scotland, which is included in the preceding tables, is separately set out in Table VI. From this will be noted an increase in the total of 12·1 per cent. Individual product uses followed the general trend for the whole of the U.K., although the consumption of motor spirit was higher than that for fuel oil.

TABLE V

UNITED KINGDOM

INDIGENOUS MATERIALS MADE AVAILABLE FOR DISTRIBUTION BY THE PETROLEUM INDUSTRY

(EXCL SHALE AND INDIGENOUS CRUDE)

(in tons)

	1956	1955
Motor spirit (by low temperature carbonization)	3,633	3,005
Motor and aviation spirit (by hydrogenation)	84,114	102,564
Refined benzole	314,489	276,944

TABLE VI
SCOTLAND
DELIVERIES INTO INLAND CONSUMPTION OF PETROLEUM PRODUCTS
(in tons)

	1956		1955	
Aviation fuels		172,153		133,001
Motor spirit (incl. motor benzole):				
Dealers:				
Premier grades	221,874		210,727	
Standard grades ...	138,331		139,510	
Commercial consumers:				
Premier grades	26,958		26,092	
Standard grades ...	125,924		135,797	
		513,087		512,126
Industrial spirits (incl. industrial benzole)		22,098		12,974
White spirit		11,457		11,645
Kerosine:				
Burning oil	58,325		53,350	
Vaporizing oil	65,367		81,312	
		123,692		134,662
Derv fuel		207,033		185,959
Gas, diesel, and fuel oils: ...				
Gas/diesel oil	242,856		217,617	
Fuel oil	457,764		357,234	
Refinery consumption ...	187,605		181,444	
		888,225		756,295
Lubricating oils and greases...		76,521		71,425
Paraffin wax and scale ...		2,441		3,122
Petroleum gases		4,688		4,655
Bitumen		158,955		156,383
Other products		112,269		62,755
TOTAL		2,292,619		2,045,002

U.S. OIL PIPELINES

At the beginning of 1956 the oil pipelines of the U.S.A. totalled 188,540 miles in length, a gain of 11 per cent over the 1952 total. The total fill of crude oil trunk and gathering lines was 63,043,000 barrels, equal to 24 per cent of the total in storage at 31 December 1955. For the product lines, the fill of 15 million barrels was equal to 5 per cent of the stocks of major light products—motor fuel, kerosine, and distillate fuel oils. The following details are summarized from a report* recently published:—

MILEAGE OF U.S. OIL PIPELINES 1955

Size inches	*Trunk lines*		*Gathering Lines*	*Total*
	Crude	*Products*		
2, 3, 4	4,508	2,000	57,223	63,731
6	11,612	8,842	11,100	31,554
8	25,623	14,192	4,061	43,876
10	13,453	4,367	556	18,376
12	9,250	4,921	549	14,720
14, 16, 18	4,804	2,098	27	6,929
20, 22	6,606	—	10	6,616
24	1,383	—	—	1,383
26	704	—	—	704
30	651	—	—	651
Total	78,594	36,420	73,526	188,540

Of the 1355 miles of 26- and 30-inch crude trunk lines, there are 542 miles in Michigan, 504 in Texas, 192 in Minnesota, 91 in Wisconsin, the balance being in short lengths in five other States.

* Crude-oil and Refined-products Pipeline Mileage in the United States, 1 January 1956. A. T. Coumbe and I. F. Avery. U.S. Bureau of Mines Information Circular 7769.

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Conferences, Congresses, and Exhibitions

Lubrication and Wear Conference

This conference, which is being held in London from 1-3 October under the auspices of the Institution of Mechanical Engineers, will deal with various aspects of hydrodynamic lubrication, boundary friction and boundary lubrication, bearing materials, additives, and two sessions will be devoted entirely to papers on wear.

Details of the conference are now available from the Institution of Mechanical Engineers, 1 Birdcage Walk, London, S.W.1., to whom application should be made for preliminary registration forms. These forms have to be returned to the Institution not later than 1 July.

Venezuela in Pictures

The Republic of Venezuela was the subject of a photographic exhibition, opened by H.E. the Venezuelan Ambassador, Senor Manuel Dagnino, on 29 April. Entitled "Prospect of Venezuela", the exhibition was staged by the Royal Geographical Society and was open to the public until 18 May.

Many of the photographs, which were the combined work of Compania Shell de Venezuela and the Shell Photographic Unit, were taken specially for the exhibition. They presented an up-to-date review of the social and economic scene in the world's major oil exporting country where striking developments in agriculture, industry, and communications testify to the wise policy which the Venezuelan Government is following in its use of the oil revenues. These aspects of modern Venezuela were illustrated against the backcloth of its geography, history, and people.

Interkama Congress and Exhibition

The Interkama Congress and Exhibition of Measuring Instrumentation and Automation will be held in Düsseldorf from 2 to 10 November 1957. Visitors will have an opportunity of attending lectures held by the representatives of manufacturing organizations.

Details are available from Nordwestdeutsche Ausstellungs-G.m.b.H., Düsseldorf/Germany, Ehrenhof 4.

The Effects of the Beaver Report on Pollution

The effects of the Beaver Report on air pollution were outlined in a talk by A. W. Forster (Esso Petroleum Co) at a meeting of the Fawley Branch of the Institute, held at Esso (Fawley) Recreation Club, Holbury, on 8 March.

Commenting on the formation of the Beaver Committee, the lecturer said that, although air pollution was causing considerable concern in many quarters before December 1952, there was little doubt that the disastrous London smog in that month heightened that concern.

Air pollution, he said, came from many sources and took many forms. It included smoke, gas, dust, and grit from chimneys, fumes from chemical works, and airborne dust due to a multitude of operations. The Beaver Committee had concentrated on air pollution arising from the combustion of fuels as being the main problem, and had set itself the task of taking stock of the known facts, its nature, cost, effects, and the method of prevention.

Atmospheric pollution, he affirmed, was always present—the intensity depending on whether one was looking at highly industrialized or rural areas, and on the prevailing climatic conditions. The most serious effects were generally felt in areas prone to mist and fogs, *i.e.* those areas where temperature inversions and still air conditions were common and where the pollutants would therefore accumulate since they were unable to disperse by thermal currents and winds.

From a map of the areas in the United Kingdom most frequently affected by fog, he said, it was significant that, generally, these areas coincided with the most highly industrialized parts of the country.

Continuing, he said that everyone was aware of the obvious effects of air pollution—dull sunless days, fogs, delays in transport, dirty buildings, and a general dulling of surroundings, but it was the less-visible factors which were perhaps of the most significance.

Health Hazards

In regard to health, he said that the now infamous smog of 1952 in London was calculated to have resulted in 4000 excess deaths, *i.e.* 4000 more people on average had died over the period. In comparing the death rates from bronchitis per 100,000 head of population for a few countries in Northern Europe, he stated that the rather startling fact emerged that between ten and twenty times as many people died from bronchitis in England and Wales than in Denmark, Norway, and Sweden. Although this might in part be accounted for by other factors, such as poorer housing and higher density of population, he felt it was significant that England and Wales were very much more highly industrialized than the Scandinavian countries and that Britain's "power" was in general generated by a combustion process whereas, at least in Norway and Sweden, very large quantities of power were generated hydro-electrically. Moreover, he said, a break down of the figures for England and Wales into those diseases associated with the lungs, *i.e.* those diseases most likely to be affected by air pollution, indicated a significant trend as one proceeded from the data for rural areas up to the highly populated urban areas of 100,000 people and over. Some 53 per cent more people die from respiratory diseases in large urban areas than in rural areas; and it could therefore be seen that the size of the area had some effect on the figures.

Just to complete this picture of gloom, he said, data collected during the 1952 smog showed some correlation between smoke, sulphur dioxide concentration, and the excess death rate. No attempt was made by the Committee to define which of the pollutants was the major cause, but there was no doubt that 4000 more people had died than normally and also that during the subsequent 2½ months a further 8000 excess deaths had occurred.

The Cost Factor

Turning from the human problem, he then dealt with the monetary cost of air pollution.

There were, he said, the direct costs covering laundry and domestic cleaning, cleaning and painting of buildings, corrosion of metals, damage to goods, additional lighting, and extra hospital and medical services. Then there were the less-visible costs in the form of loss of efficiency, effects on agriculture due to damage to crops, interference with transport, and reduced efficiency due to illness. The Beaver Committee put the cost of air pollution in the United Kingdom at about £250 million per annum, which was equivalent to £5 per head of the population, or £10 per head per annum of population actually located in the black areas.

Evidence had been taken from a variety of people. A retail firm in the London area had reported that after the 1952 smog it had to reduce prices on soiled goods equivalent to £90,000 loss in trading receipts.

As further evidence that the £250 million figure quoted may not be far wide of the mark, he said that in Pittsburgh, U.S.A., where pollution had been effectively eliminated to a large extent by the aid of legislation, the estimated saving was calculated to be $27 million, or £14·5 per head per annum of the population.

The lecturer then dealt with the main sources of pollutants discharged into the atmosphere. He said that coal, being the indigenous fuel of the country, was, of course, the major fuel burned. Of the 205 million tons burned in 1953, he said that 18 per cent went into domestic use, but it was estimated that this 18 per cent accounted for 45 per cent of the smoke produced by the total coal burned.

The Oil Problem

Oil's part in this pollution problem at the moment was, he said, small, but due to a widening gap which could not be filled by coal in Britain's energy balance, oil was scheduled to become of increasing importance although it was never likely to assume the same importance as coal. However, since most fuel oils contained up to twice as much sulphur as that in coal, their proportionate effect was that much greater and one wondered what conditions would be like in 1965 unless something was done overall before then.

The overloading of boilers and furnaces was probably the chief cause of smoke from industrial sources. The Committee found that, with few exceptions, no industrial chimney need

emit smoke other than a light haze if the combustion arrangements were adequate and the furnaces properly operated.

He then dealt briefly with the Committee's observations and recommendations concerning the emission of grit and dust, pointing out that power stations were probably the biggest single source of this type of pollution due to the enormous quantities of fuel burned. This, he said, was usually a low-quality high-ash coal which was pulverized before firing, and even with the most elaborate equipment, the complete prevention of emission of dust was impossible.

Dealing with sulphur pollution, he stated that this was undoubtedly increasing. First, the sulphur content of mined coal was increasing and the use of fuel oil (which had a sulphur content four times as great as coal) was rapidly expanding. Even allowing for efficient washing at the colliery, a large proportion of sulphur remained in the coal and the extraction of sulphur from fuel oil, whilst possible, could only be done at prohibitive cost. Some means of washing flue gases was the alternative and at the present time this was only economically possible on very large units. Standard practice was now to use tall chimneys, *i.e.* greater than 300 ft with the object of ensuring that sulphur dioxide was emitted at a sufficiently high level to permit dispersion at below noxious limits.

The Beaver Committee, he said, had commented that high stacks did not really dispose of the need for gas washing nor the converse. However, although gas washing and large chimneys were satisfactory for large units, this still left 75 per cent of the problem unsolved, since no known method existed whereby the greater part of sulphur dioxide could be removed from industrial and domestic chimneys.

Domestic Smoke

Reverting to the fact that, nearly half the smoke produced annually came from domestic chimneys, he said that although the smoke was less dense than that usually resulting from industrial operations, it was discharged at a low level and its harmful effects were, therefore, accentuated. In the Beaver Committee's opinion, he said, there could be little justification in asking industry and commerce to abate pollution at considerable cost if the problem of domestic smoke was not tackled at the same time.

In regard to domestic smoke and pollution, he said that there were two major problems: one concerned the type of burning appliances available and the other was the availability of smokeless fuels.

The availability of smokeless fuel was limited by manufacturing capacity and there was no doubt that all the coal currently burned could not be replaced with smokeless fuel even if a large-scale reorganization of fuel supplies was to be attempted.

Assessment of the Report

He continued by saying that it was difficult to assess quantitatively the effects of the Beaver Report, since without a follow-up Committee a full review of the situation would not be possible. However, it was very evident that as a result of the report there was increased public awareness of the problems and effects of air pollution, although it was probable that this had now died away. Nearly all new grates which were available for purchase appeared to have incorporated at least some devices which attempted to minimize smoke and improve efficiency.

The main result of the Beaver Report was a piece of legislation, known as the Clean Air Act, which was passed on 5 July 1956, the salient points of which were stressed by the lecturer.

He concluded his talk by stating that if one applied this Act rigorously and stirred up a live public interest in the problem, there was little doubt that great improvements over the present state of affairs could be obtained.

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Middle East Pipelines

Representatives of the companies who met in London in March to discuss plans for increasing pipeline transportation of oil in the Middle East were again in conference in London from 13 to 16 May.

In a statement issued at the conclusion of the Conference it was announced that a continuing group had been set up to give further study to the many intricate technical, financial, and legal problems involved. It was hoped that these studies would result in proposals sufficiently concrete to permit of their being presented for discussion with the governments concerned. Further meetings will take place from time to time to consider the results of the continuing studies.

The new pipeline system under study is designed to provide by stages transport to the Mediterranean seaboard of some 70 million tons a year (1·4 million barrels per day) of crude oil. This amount is required to assist in meeting the increased demand forecast for the early 1960's and the proposed system is to supplement but not replace the full use of existing facilities. It is anticipated that the first stage of the project will be to transport about 40 million tons per year (800,000 barrels per day) through one 38/40-inch line.

The eventual provision of capacity equivalent to about double this is being considered and, in selecting the route, an important factor will be the need to improve the operating efficiency and flexibility of oil transportation in the Middle East. Preliminary estimates indicate steel requirements as about one million tons, pumping and ancillary equipment for ten or twelve pumping stations, and total cost of the whole project as over £300 million.

In addition to the seven companies represented at the March meeting a number of others were represented at this Conference. The total representation was:

American Independent Oil Company;
The Atlantic Refining Company;
The British Petroleum Company Ltd;
Compagnie Française des Petroles;
Getty Oil Company;
Gulf Oil Corporation;
Hancock Oil Company;
Richfield Oil Corporation;
Royal Dutch/Shell;
San Jacinto Petroleum Corporation;
Signal Oil and Gas Company;
Socony Mobil Oil Company Inc;
Standard Oil Company (New Jersey);
The Standard Oil Company (Ohio);
Standard Oil Company of California;
The Texas Company;
Tidewater Oil Company.

International Synthetic Rubber Symposium

During 1957 some of the plants which have been established in Britain for the production of synthetic rubber will come into operation. In recognition of this fact an International Symposium on Synthetic Rubber was held at Church House, Westminster, London, on 26-28 March to "gather together information on the latest types of rubbers under development, and to suggest new uses for this important group of engineering materials." The symposium was organized by the editorial staff of *The Rubber and Plastics Age*, and was under the Chairmanship of G. E. Beharrell, F.I.R.I., chairman of the International Rubber Co Ltd, vice-chairman and managing director, Dunlop Rubber Co Ltd. About six hundred delegates attended the meeting and there were contributions from American, German, Italian, and British authors.

The relation of the petroleum industry to the synthetic rubber industry was noted by E. A. Murphy (Dunlop Research Centre) when, in recounting British developments in synthetic rubber, he said that during the war of 1939-45 it had been decided to concentrate production of synthetic rubber in the United States where a large petroleum chemicals industry was already in existence. As a result, large-scale developments in Britain had to await the expansion of refining capacity which took place in the early 1950s.

In the course of his lecture, Mr Murphy pointed out that the outstanding recent developments in the industry as a whole were those connected with polymerization brought about by catalytic agents obtained from compounds of the transition elements. These catalysts give diene and olefin polymers possessing a more regular chemical structure than conventional polymers, as a result of which the polymers have much improved properties. Basic Italian research in this field was described by Professor G. Natta (Instituto di Chimica Industriale del Politecnico di Milano) who dealt with the structures and fundamental properties of polydienes and poly-α-olefins obtained by catalysis with agents of the transition metal halide type. A paper presented by R. P. Kenney (B. F. Goodrich Chemical Co) dealt with the *cis*-1, 4-polyisoprene produced from isoprene by this technique. Synthetic polyisoprene appears to be so closely similar to natural rubber that it may be used in place of the natural product in practically any application. At present, however, the price of isoprene is such that the polymer is unlikely to be a serious competitor to the butadiene rubbers as a general-purpose material. Developments in the polymerization of butadiene have also been made using heterogeneous catalysis. The properties of vulcanizates of 1,4-polybutadienes of various *cis-trans* ratios were discussed by Dr Gerard Kraus (Phillips Petroleum Co) who presented data showing that polymers essentially free of branching and containing a high proportion of *cis* bonds had mechanical properties comparable with those of natural rubber and that polymers of 60–80 per cent *cis* content were especially interesting in their good performance at temperatures as low as −40° F.

In the field of butyl rubber, Dr W. L. Dunkel (Enjay Laboratories) described the relationship of the structure of the butyl chain, with its regularly spaced methyl side groups, to the ozone, chemical, and heat resisting properties, high impermeability to gases, and good damping qualities of butyl vulcanizates. D. J. Buckley reported the investigations of the Esso Research and Engineering Co which have led to a solution of the problems of low resilience and low rates of vulcanization in butyl rubbers and to the development of butyl latices and a new rapidly vulcanizing butyl polymer. Consequent upon these advances, tyres of all-round high quality have been manufactured from butyl polymers and butyl rubber appears to be assured of a future in this sphere.

A new family of elastomers prepared by free radical addition of aliphatic mercaptans to the double bonds of diene polymers was described by R. M. Pierson (Goodyear Tyre and Rubber Co). These elastomers are claimed to have outstanding performance in resistance to ageing, ozone attack, heat, solvent swelling, and to permeation by gases.

A new plant for the production of 45,000 tons per year of butadiene styrene copolymer to be erected for the Chemische Werke Hüls A. G. in Western Germany was described by Professor Dr Paul Baumann. The butadiene for this plant is to be produced by dehydrogenation of *n*-butane by the Houdry process, the dilute diene being concentrated by the copper ammonium acetate extraction process of the Esso Research and Engineering Co. An account of the Chemische Werke Hüls butadiene vinylpyridine copolymers, which are to be specifically used in the impregnation of textile goods to improve their adhesion to rubber, was given by Dr W. Gumlich.

Among the special-purpose rubbers, the oil-resistant nitrile and acrylic types were discussed by P. H. Stamer (British Geon Ltd), while fluorine-containing silicone rubbers for use in contact with aromatic solvents and jet fuels were referred to in the paper on silicone rubbers by P. C. Servais (Dow Corning Corporation). The du Pont Company's neoprene latices were described by E. P. Hartsfield, the fluorine rubbers by Dr J. C. Tatlow (University of Birmingham), and self-reinforced elastomers by E. E. Gale (Polymer Corporation).

Dr E. Muller gave a lecture on "Vulcollan" polyurethane rubber and the symposium concluded with a paper in which Dr W. McG. Morgan (Monsanto Chemicals Ltd) discussed the auxiliary materials for synthetic rubber, including vulcanizers, accelerators, fillers, and antioxidants.

The papers presented at the symposium are to be published in *The Rubber and Plastics Age*.

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British Petrol Rationing Ended

Lord Mills, Minister of Power, announcing in the House of Lords on 14 May that petrol would be derationed from the following day, said that petrol stocks in Britain were at a satisfactory level and now that interim arrangements have been made for the resumption of traffic through the Suez Canal, the Government had decided that petrol rationing could be ended.

A similar statement was made in the House of Commons by the Paymaster General, who in reply to a request for a statement regarding the emergency surcharge still imposed upon petrol, said that the matter was under discussion with the oil companies.

(NOTE: *By reductions in the retail prices of motor fuels on 18 May, the remainder of the emergency surcharge was removed.*)

During their stay in England, the FEPEM representatives visited the establishments of Elliott Brothers (London) Ltd at Borehamwood, Lewisham, and Rochester. They are seen here at the Fisher Governor Company, Rochester, a subsidiary of Elliot Brothers.

European Equipment Manufacturers visit Britain

Recently, members of the Federation of European Petroleum Equipment Manufacturers (FEPEM) visited Britain in order to study instruments used in the petroleum industry. The participants included representatives from Belgium, France, Germany, Italy, and the Netherlands. On 8 April, the Council of British Manufacturers of Petroleum Equipment, who are members of FEPEM, were hosts to the overseas representatives at an informal dinner held in London. The chair was taken by G. V. Sims, chairman of the CBMPE, and he proposed the toast of "The Guests."

Gerald Nabarro, M.P., responding to the toast of "The Guests," proposed by the chairman, said that the taxation of road users had become the most vicious blood sport in Britain, and every year there was a bigger and bigger killing. Conservative Chancellors had been guilty of increasing oil duties even more than their Socialist predecessors. In 1951, the petrol tax brought in £125 million; now the yield had swollen to £340 million. In 1951 the petrol, vehicle, and purchase taxes totalled £212 million; in the financial year just ended the figure had increased more than two and a half times, to £550 million. And although the figures boggled the imagination, it was the fact that in the seven years since 1950 the total sum extracted from road users in Britain had reached the stupendous figure of £2700 million.

Oil's Future

All in the House of Commons were anxious as to the future of oil supplies; we were not yet through the crisis which had started last November, and earlier than that, with the Nasser grab of the Suez Canal.

Whatever the future might hold, a lasting benefit would flow from the sad events of the last few months, and that was a reinforcement of our love for the French people.

Very great difficulties would confront us in fuel and power matters and in production and economic matters in the next few years, especially having regard to the scheme for the European free trade area, which would undoubtedly bring the fiercest competition. If incentives were to be provided at every level in industry, particularly the oil industry, the chemical, steel, and other most important industries, it could come only from a reduction in the rate of income tax and the level of surtax. Those were in his opinion the primary objectives.

Referring to energy problems, he said there seemed to be few who yet realized that, notwithstanding the huge investments which Her Majesty's Government proposed to make in nuclear development, in eight years' time, *i.e.* by 1965, only 6 per cent of all our energy needs could be provided from nuclear sources, and the responsibility for providing the other 94 per cent would remain on the broad shoulders of coal and oil. If coal production in Britain still remained static, it would be self-evident that fuel oil for providing the energizing force in industry must be needed in ever increasing quantities. In his view, until the dawn of the 21st century the oil industry had a vital contribution to make to our fuel and power needs in these islands. If anybody imagined that atomic energy would displace fuel oil for all purposes he was guilty indeed of wishful thinking. And even when atomic energy was firmly in the saddle, the rôle of oil and of coal would always be to provide those precious chemicals without which modern science could not progress and raise the living standards of countless millions of our fellow human beings in what were called the undeveloped lands.

Co-operation in Equipment Manufacture

M. Georges Perret, a member of the FEPEM Executive Council, proposed the toast of "The CBMPE" and expressed their indebtedness to the Council for their organization of the visit to Great Britain. In doing so he recalled that both the World Petroleum Congress in 1951 and the OEEC Mission to the U.S.A. recommended the close co-operation between manufacturers in different European countries. In 1953, the OEEC Mission had studied the production of petroleum equipment in Europe and had recommended the formation of a European Council to guide manufacturers as to the needs of the oil industry. Within a short space of time the FEPEM had been founded under the leadership of the late Mr Wilson and with the assistance of the CBMPE.

The toast was acknowledged by Colonel Oliver Sherlock.

Britain's Energy Resources

A Bold Policy Necessary

Opening a debate on Britain's energy resources on 30 April, Reginald Maudling, the Paymaster-General and spokesman in The House of Commons for the Minister of Power, said it was a convenient time to discuss the demand likely to fall on Britain's energy resources and the best methods to meet them. Britain may well be at the beginning of a new phase in fuel policy, he said. In recent years increasing quantities of oil had had to be imported to supplement coal.

One factor which might change the post-war picture was the difficulty of importing oil from overseas coupled with the growing world demand. Another factor was the rapid progress achieved by scientists in harnessing nuclear power for civil purposes.

In its energy policy Britain must be bold and should plan for too much rather than too little energy. There must be consideration for costs, as capital costs for sources were rising steadily and were already a serious burden on the economy.

On the technical side, changes in the nuclear field were very rapid and no man could predict where scientific researches would lead. It was difficult to be precise about price relationships between coal and oil and changes over 10 years might make a great difference in total demand for various fuels. Policy must change to meet changing circumstances and therefore detailed planning for a long time ahead was not possible or wise.

Continuing, Mr Maudling said he would like to produce a picture of development in the next 8 or 10 years and thought 1965 a convenient date, because the National Coal Board investment plans and the nuclear electricity programme both ran to that year. The best estimate for total inland fuel demand, which was about 250 million tons of coal equivalent in 1955, was that it should rise to over 300 million tons in 1965. That assessment was reached by estimating the probable growth of total industrial production and to check that against likely developments of individual fuel consuming industries. Industrial production was taken at 3½ per cent per annum compound, which was equivalent to 3 per cent a year in the national income. That target was ambitious but not impossible.

If the history of fuel consumption in Britain was studied it would be seen that in the middle of the last century it was increasing at about 4 per cent a year; by the end of the century it was increasing at only 1 per cent a year; and between 1913 and 1945 there was no net increase at all. Since 1945 the rate of expansion of fuel demand had averaged 2½ per cent a year.

Taking all these factors into account it had been assumed that the consumption of energy would continue rising at just under 2 per cent a year. That, by 1965, gave total inland demands for energy as 300 million tons of coal equivalent.

In addition to fuel for inland consumption, some increase in net exports must also be planned and the Minister of Power had already announced that an endeavour should be made to cancel out the current imports of about 5½ million tons of coal and try to restore the cuts in coal exports of another 5 million tons, thus giving a target of increasing net coal exports by about 10 million tons. Towards the increase of 60 million tons between 1955 and 1965 it was hoped to get another 20 million tons of coal from deep mining and open cast working, thus leaving 40 million tons of coal equivalent to be found by 1965. That was part of the background to the nuclear fuel policy, said Mr Maudling, and the other part of the background was the current cost of importing energy which amounted to about £25 million a year net. On these rested the main case for the nuclear energy programme.

The programme is for 5000 to 6000 megawatts of nuclear capacity by the end of 1965 and there was no doubt that development of this programme would be a very heavy burden. The total cost of the new stations was £919 million, of which about £740 million was the cost of the stations and about £170 million the cost of the first nuclear charge.

The justifications underlying the nuclear programme were that by the end of 1965 the stations would be producing electricity equivalent to that produced by about 14 million tons of coal a year. So taking the gap of 60 million tons of coal equivalent, there was towards it 20 million tons of coal and 14 million tons from nuclear energy, leaving 26 million tons of coal equivalent to be made up by imported oil, an increase of over 50 per cent on present imports.

The current rate of import on oil for use in Britain was about 28 million tons, which was small in comparison with the world production of 750 million tons in 1955. Of that production British and British/Dutch companies control between them about 150 million tons, including 35 per cent of the resources of the Middle East.

Mr Maudling said that a reliable source in the oil industry had estimated that investment over that decade throughout the free world in oil production would be about £40 thousand million. That investment could only be paid for very largely through the retained profits of the oil companies, and for that reason they must have them.

On the question of output balance at oil refineries, he said there was a limit to variation in proportions of light and heavy oils. If the comparative demand changed considerably, it might make difficulties.

The technical possibilities of importing liquid methane for the manufacture of gas were also being examined.

The Minister of Power attached importance to the possibility of extracting oil from small coal. The problem was not so much technical as economic, as no one had found a way of doing it at a reasonable cost.

What should be Britain's policy in regard to oil, asked Mr Maudling. In general he was confident that adequate oil should be available to Britain throughout the oil-producing areas. The problems were those of transportation, many of which concerned the availability of steel, particularly steel plate for tankers and pipelines.

The coal-oil conversion programme might need some rephasing, particularly in view of the task of building up fuel oil stocks from the low level at which they now stood.

Petroleum in Parliament

Oil Pollution Convention

On 10 April, the Minister of Transport and Civil Aviation said that before the Convention of 1954 comes into operation ratification is required by ten countries, including five with at least 500,000 gross tons of tanker tonnage. Eight countries, of which four have the requisite tanker tonnage, have already ratified and a number of other countries have legislation in preparation to enable them to do so.

The countries which have ratified the Convention are the United Kingdom, Canada, Denmark, the Federal Republic of Germany, the Irish Republic, Mexico, Norway, and Sweden.

He also said that it was preferable not to convene a further international conference until the Convention has come into force and the U.K. has had some experience of its operation.

Oily Water Separators

The Minister said that regulations requiring dry cargo ships to fit oily water separators by 30 June 1958 had not yet been made, as he was still discussing them and the consequential arrangements with the shipping industry and the separator makers.

Petrol Rationing

On 15 April, the Paymaster-General said that he had stated on 20 February that the removal of petrol rationing depended on the assurance of an adequate and regular flow of supplies. It was the Government's view that having regard to the present situation in the Middle East, it would be unsafe to assume that this condition had yet been satisfied, and it had been decided, therefore, that petrol rationing must stay for the time being. Nevertheless, petrol supplies had improved, and this had been reflected in the increased allowances already announced for the new rationing period beginning on 17 April.

Hook Oil Refinery Project

On 16 April, the Parliamentary Secretary to the Ministry of Housing and Local Government and Welsh Affairs said that he understood that no application for planning permission had been made for the establishment of a small refinery at Hook, Warsash, Hants. If one is made it would be referred to the Minister and a public enquiry would be held.

Investment Allowance for Fuel Saving Plant

In a written reply on 18 April, the Chancellor of the Exchequer said that he had it in mind that the following further fuel-saving plant should qualify for the investment allowance:—

Description of Plant	*Conditions*
2(a) Oil-firing equipment: oil drip feeders.	—
4 Waste heat recovery equipment: (c) flash steam vessels: piping, ducts, and fans.	On condition that the equipment is installed for the purpose of recovering for use heat from hot waste gases, vapours, or liquids.
8(b) Indicating and recording instruments: Fuel meters.	On condition that the instruments are affixed to boiler or other installations.

Trade Literature, etc.

Equipment for the Petroleum Industry

Details of a wide range of distillation equipment and stainless steel process plant are contained in a useful leaflet (BT. 156), which is available on application to Metal Propellers Ltd, 74 Purley Way, Croydon, Surrey.

Natural Gas to Fertilizer

The conversion of natural gas, air, water, sulphur, and phosphate rock to ammonium nitrate and ammonium phosphate fertilizers is described in the latest Kelloggram, entitled "Chemical Fertilizers for Canada's West". This describes the six processes used, the key process being Kellogg's steam methane high-pressure reforming process which produces 100 tons of ammonia per day.

Pneumatic Tool Lubrication

This attractive 44-page booklet is the latest in the Mobil technical series and is intended to complete and also to be complementary to the story in *Air Compressor Lubrication*, published previously.

It contains 39 useful illustrations, mostly in colour, and the subject is split into five main sections. Percussive type portable tools are considered first from the point of view of operating mechanism and design. Then the reader is introduced to rotary type portable tools and to a section on miscellaneous tools which includes those not covered in the previous two sections. Air conditioning for pneumatic tool operation is dealt with in detail, and a final section covers all aspects of lubrication for pneumatic tools.

The booklet is available on application to Mobil Oil Co Ltd, Caxton House, Westminster, London, S.W.1.

★ ★ ★

Pyrene Secures $1,500,000 Crash Tender Contract

Airfields of the Royal Canadian Air Force are to be equipped with crash fire tenders made in England by The Pyrene Co Ltd, the contract being valued at approximately one and a half million Canadian dollars.

The type of vehicle selected is the "Pyrene" Mark VI—which projects foam at the rate of over 5000 gallons per minute. It is built on an "Alvis" M.O.S. 6 × 6 chassis, powered by a Rolls Royce engine and having four-wheeled steering. The unit is designed to overcome the problems associated with exceptionally rough or boggy ground.

World Voyage for Lifeboat

To prove the weather-tight claims of the *Dana Rescuer*, a new type of lifeboat, 38-year old Walther Westborg is to take it on a solo voyage round the world. It is 23 feet long, 8 feet in beam, and can carry 30 people. Its engine is a 58-h.p. diesel and its tanks hold 570 gallons of fuel. For protection against weather and extremes of temperature, the vessel is coated with "Epikote" resin-based paint. "Epikote" resins are manufactured by Shell.

Cathodic Protection of Ore Carriers

A new type of cathodic protection for ships, such as ore carriers having ballast compartments but no inflammable cargo, is claimed to offer advantages over the conventional magnesium anode type of installation.

The scheme employs impressed current and, although the cost is a little more than that of the magnesium anode type, the life is several times longer. Details are available from Metal and Pipeline Endurance Ltd, Artillery Mansions, Victoria Street, London, S.W.1.

Mobile Valve Exhibition

A 21-ft trailer, containing a selection of valves and fittings manufactured by Newman, Hender and Co Ltd, has recently left for a Continental tour of Belgium, Holland, Denmark, Sweden, and Norway.

When possible, the vehicle will be parked on a central site where visitors will be invited to inspect the Newman-Bowler steam valve, Newman-Milliken lubricated parallel plug valve, Newman-McEvoy automatic self-sealing conduit gate valve, and a display of VEE-REG valves.

Steam Heating Coils for Tankers

Tests carried out over a period of three years in a 28,000-ton tanker indicate that "Alumbro" aluminium-brass steam heating coils offer better resistance to sulphurous crude oil and the hot sea water used for tank washing than the more conventional types made of iron or steel.

The coils, which can be either prefabricated or shaped aboard ship, are constructed from tubes ranging from one to two inches in diameter in lengths up to 35-ft with a hardness of approximately 110 diamond pyramid or in the annealed condition. Suitable jointings are also available.

Further details will be supplied on request to Imperial Chemical Industries Ltd, Metals Division, Imperial Chemical House, Millbank, London, S.W.1.

Chemical Production Flow Sheets, Plant Diagrams

A new set of leaflets has been published under this title in the "DECHEMA Exchange of Experience", which represents a new and enlarged edition of the set of leaflets issued in 1949 entitled *Construction Flow Sheets, Symbols used for Equipment*, which has long been out of print.

The new set consists of 40 sheets, containing 220 diagrams of the types of equipment which are most commonly used in chemical technology.

Sets, price DM 16, or DM 12·80 for members of DECHEMA, including postage and packing, are obtainable from Deutsche Gesellschaft für chemisches Apparatewesen, Frankfurt am Main 7, Postfach.

Secar 250

The properties and characteristics of this white calcium-aluminate cement are outlined in a 16-page booklet, entitled "Super Duty Refractory Concretes", which is available from Lafarge Aluminous Cement Co Ltd, 73 Brook Street, London, W.1.

The manufacturers claim that this cement is suitable for linings operating in reducing or highly corrosive atmospheres, *e.g.* oil reactors, and high-intensity gas and oil-fired burner quarls, involving service temperatures between 1200° and 1800° C.

The Company has also issued a completely rewritten version of its booklet on "Refractory Concrete."

Counter Attack on Corrosion

With the object of combating many of the corrosion problems of unusual severity which exist in the chemical and steel industries, a new range of coatings based on neoprene and "Hypalon" has recently been introduced by E. and F. Richardson Ltd, Buckingham.

It is generally considered that a coating, whose final thickness is under 5 mm, fails due to inadequate coverage on hard-to-coat areas. Single-coat film builds of over 10 mm are claimed to be obtained easily with the new coatings, known as Semprene-Adcora.

Two of its characteristics, *i.e.* ability to withstand severe abrasion and high temperatures, should make it an attractive proposition in the petroleum industry.

Acheson's New Address

The Technical Sales and Service Department of Acheson Colloids Ltd has recently moved to 70 Hill Street, Richmond, Surrey (Telephone: RIC 2066 and 2634).

The Accounting Section remains at 18 Pall Mall, London, S.W.1

★ ★ ★

SITUATIONS VACANT

ANALYTICAL CHEMIST

ESSO RESEARCH LIMITED have vacancies at their Abingdon Laboratories for **Analytical Chemists** to work in the field of petroleum and allied products. Applicants should possess a university degree or the equivalent, and have at least two years' experience in operating equipment and interpreting results in the fields of mass or optical spectrometry. The posts are permanent and pensionable.

Applications giving brief personal details should be made in writing to: The Manager, Esso Research Limited, Abingdon, Berks.

LITERATURE CHEMIST

BRITISH PETROLEUM COMPANY LIMITED has a vacancy in the Technical Information Section of their Research Station, Sunbury-on-Thames, for a **Literature Chemist** preferably with a knowledge of the Petroleum Industry. A reading ability of German and French required. Additional languages desirable. Duties include the searching of published scientific literature other than Patents and the writing of Précis and Abstracts. Non-contributory Pension Fund. Assisted House Purchase Scheme. Removal expenses and settling-in allowance payable in certain cases. Luncheon Club. Write, quoting reference H.3998 to Box 5242, c/o 191 Gresham House, E.C.2.

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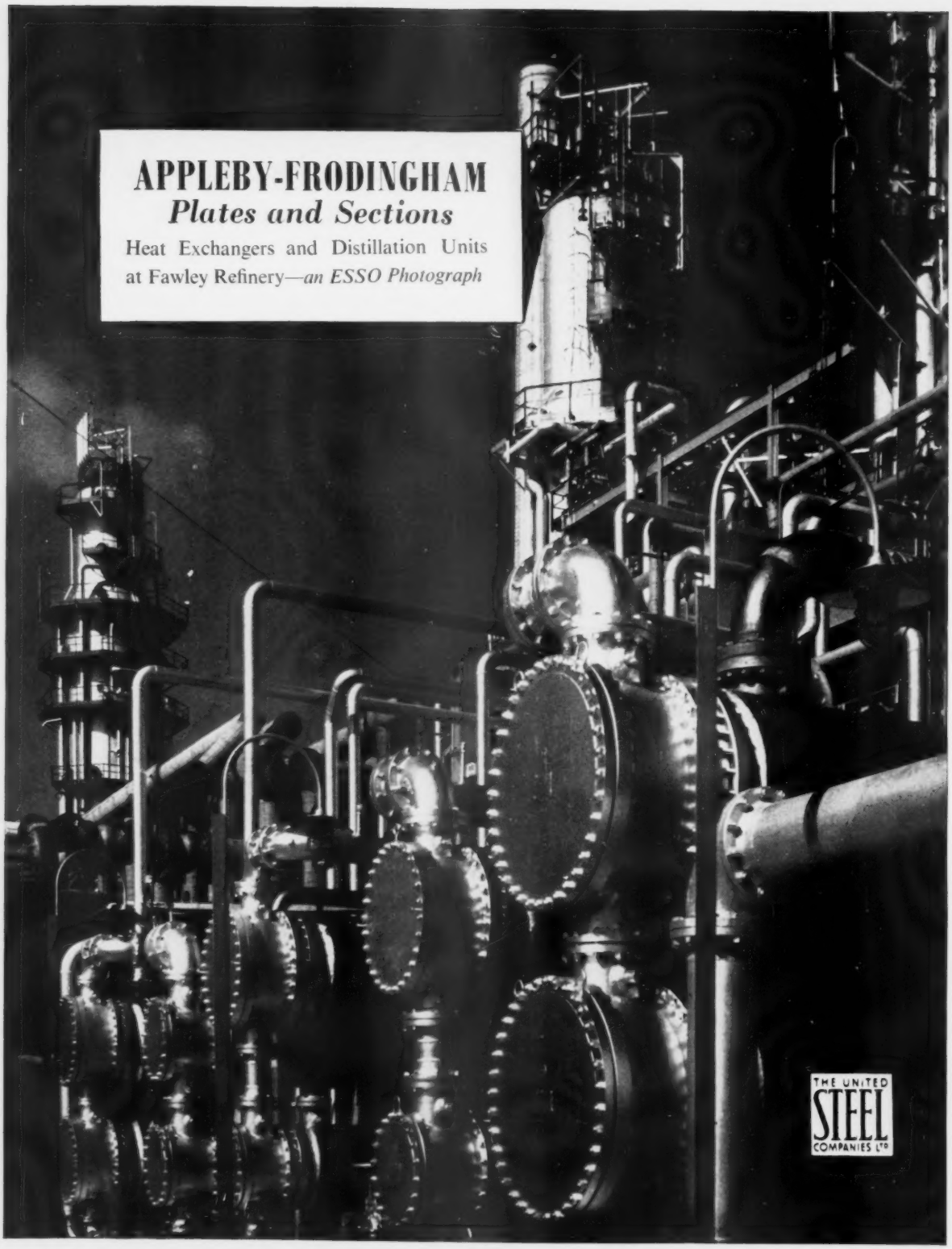

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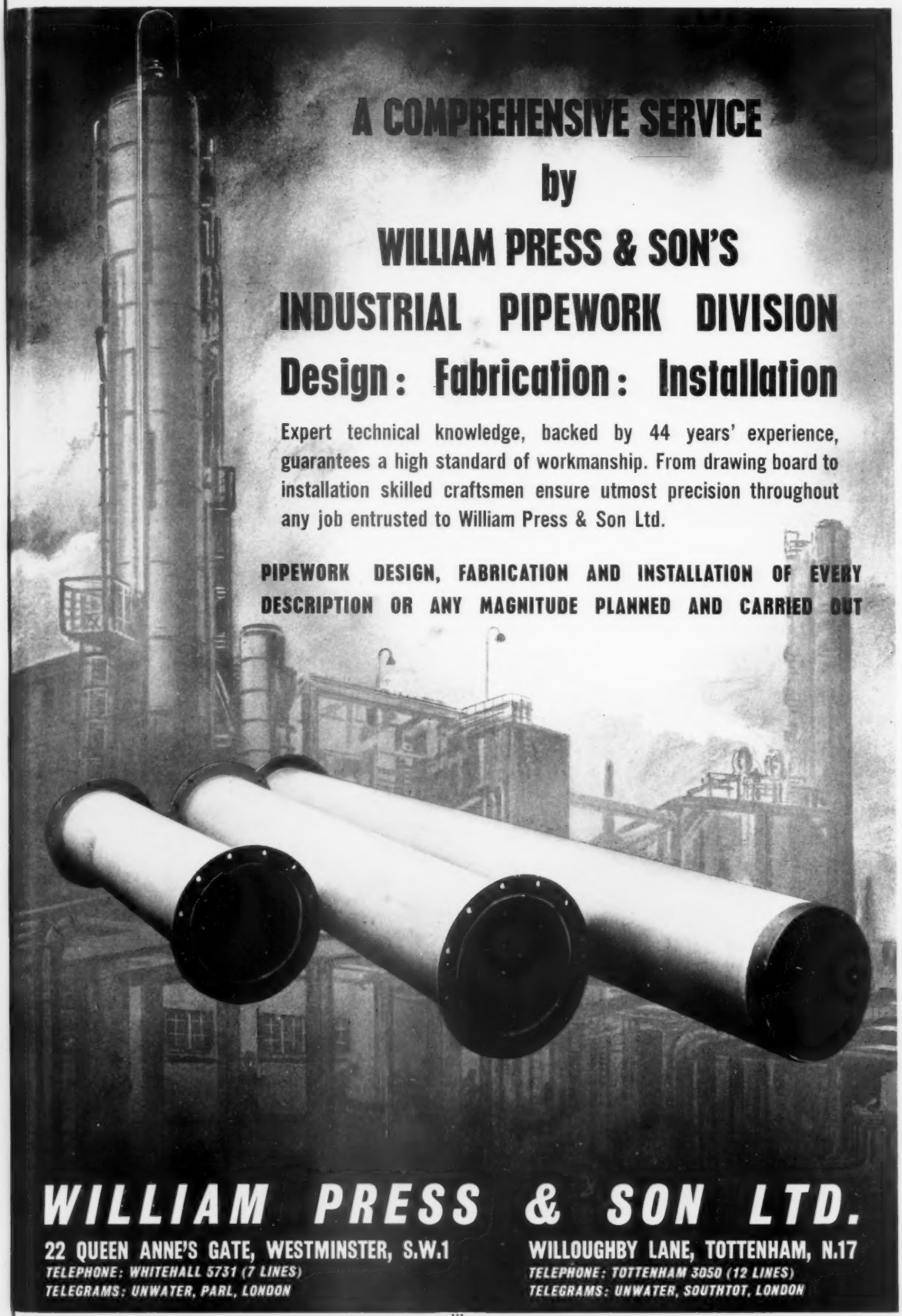

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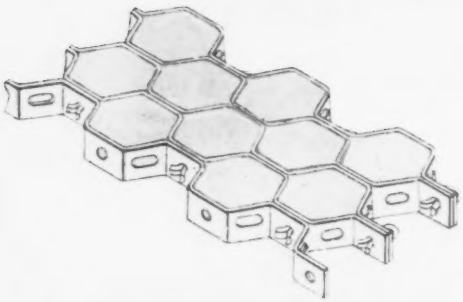
CORROSION in Oil Refineries.

in Five Continents



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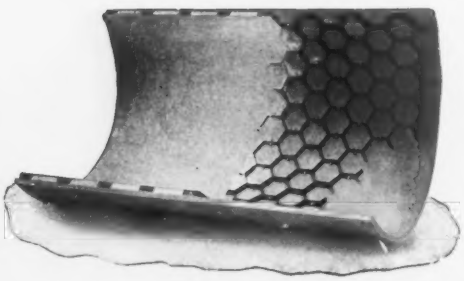

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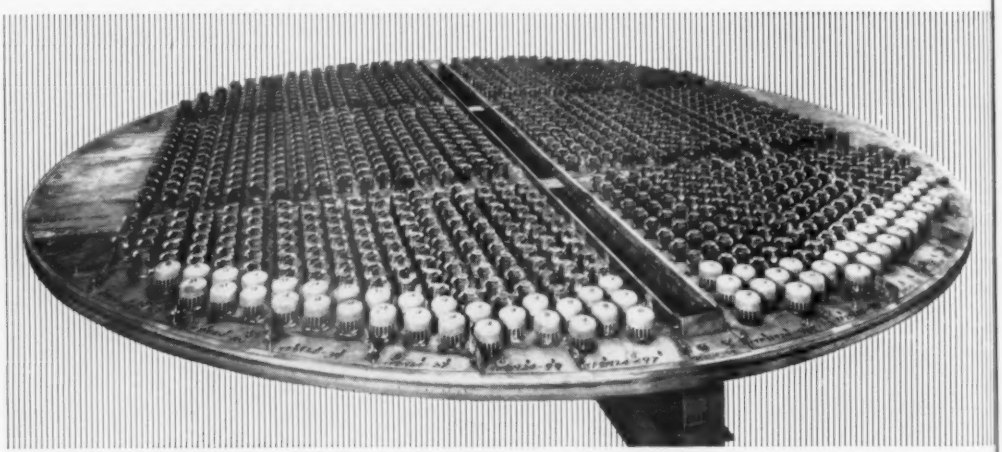

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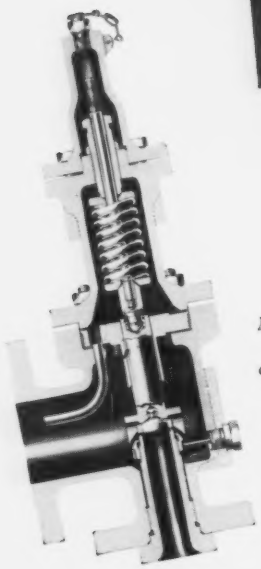

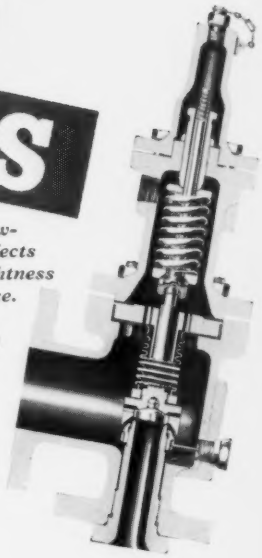

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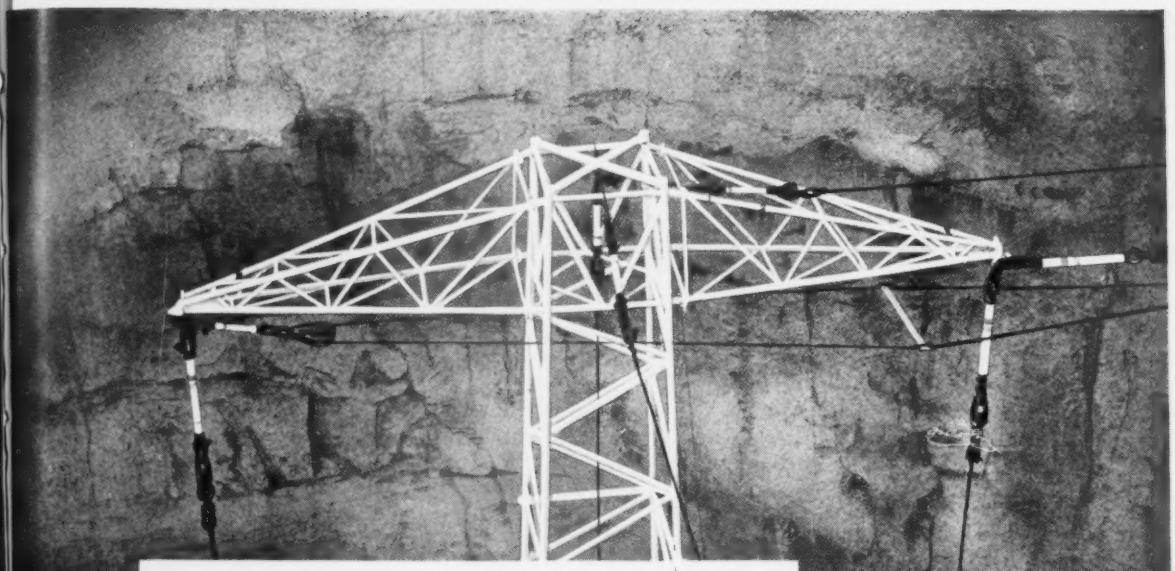

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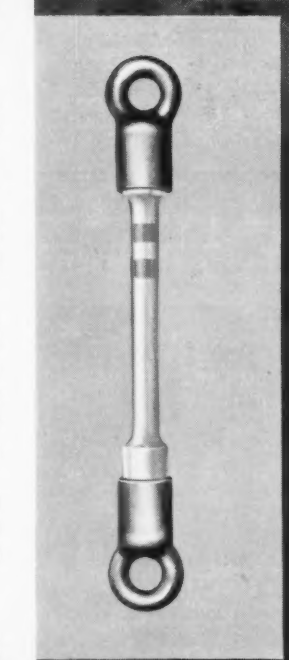
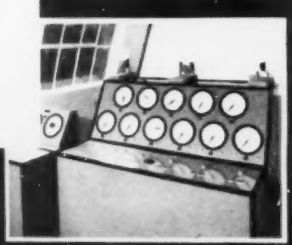
In the illustration a number of Pullmeters are being used to measure loads applied to a transmission tower under test. The simple electrical 'transmitter' of the Pullmeter is housed in a steel tube shackled into the ropes applying the load. The very small extensions of the steel tube under tensile loads are transmitted electrically to the test-house where the loads, expressed in tons, are indicated on dials.

Basically, the device within the Pullmeter transmits to a remote indicator the changes of dimensions of a few thousandths of an inch and is therefore useful in many other aspects of research where small dimensional changes are to be measured.

Right: A Pullmeter. Below right: Load and deflection indicators





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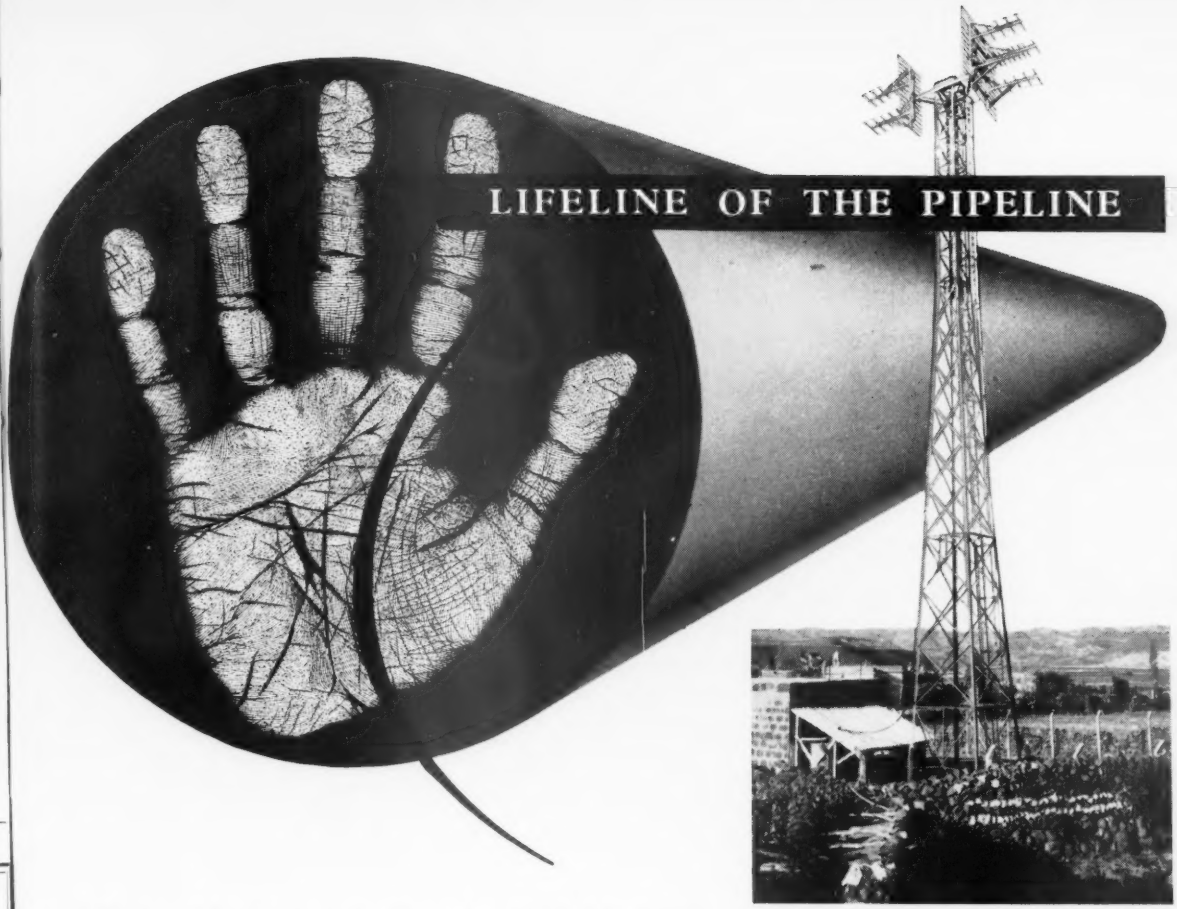

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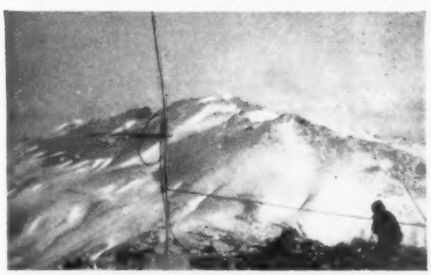
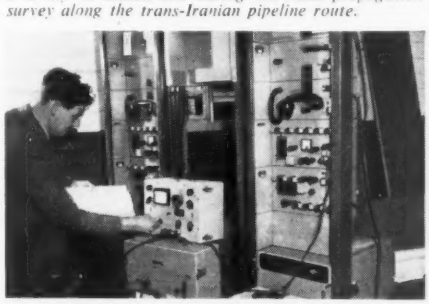
A repeater station installed at Dahr Safra for the Iraq Petroleum Company. Duplicated power supply and automatic changeover facilities ensure uninterrupted service in 4 channel VHF link stations of this type.



A Marconi survey engineer tests for signal strengths at a lonely mountain site during the radio-propagation survey along the trans-Iranian pipeline route.



Development work at Chelmsford on HM 181 VHF multi-channel equipment. Eighty-four of these will be supplied for the trans-Iranian scheme.

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	PAGE
Audley Engineering Co Ltd	May
Anchor Chemical Co Ltd	May
E. B. Badger & Sons Ltd	Inside Back Cover
British Petroleum Co Ltd, The	xv
British Thomson-Houston Co Ltd, The	May
Causeway Reinforcement Ltd	xiv
Consolidated Pneumatic Tool Co Ltd	May
A. F. Craig & Co Ltd	iii
Dewrance & Co Ltd	vxi
Dorr-Oliver Co Ltd	May
Electrothermal Engineering Ltd	May
Elliott Bros. (London) Ltd	—
English Electric Co Ltd, The	May
Esso Petroleum Co Ltd	—
Evertaut Ltd	May
Fawcett-Finney Ltd	xx
Fischer & Porter Ltd	xxii
Fisher Governor Co Ltd	i
Ford Motor Co Ltd	ix
Fothergill & Harvey Ltd (Tyglas)	Mar.
W. J. Fraser & Co Ltd	x
A. Gallenkamp & Co Ltd	May
Geophysical Prospecting Co Ltd	May
Matthew Hall & Co Ltd	xi
John Harper & Co Ltd	May
W. C. Holmes & Co Ltd	May
Honeywell-Brown Ltd	ii
Hydronyl Syndicate Ltd	Apr.
International Paints Ltd	xxi
A. Johnson & Co (London) Ltd	xxii
Kellogg International Corporation	viii
Kelvin & Hughes (Industrial) Ltd	—
Lake & Elliot Ltd	May
J. Langham Thompson Ltd	May
London & Thames Haven Oil Wharves Ltd	vi
M & C Switchgear Ltd	May
A. & J. Main & Co Ltd	Mar.
Marconi's Wireless Telegraph Co Ltd	xix
Metal Containers Ltd	Back Cover
Metal Propellers Ltd	xiv
Metropolitan-Vickers Electrical Co Ltd	Apr.
Moon Brothers Ltd	Apr.
Motherwell Bridge Contracting & Trading Co Ltd	May
Nu-Swift Ltd	May
Ralph M. Parsons Company	Jan.
Peirson & Co Ltd	May
F. Perkins Ltd	iv
Petroleum Inventions Ltd	May
Petrolite Corporation	May
W. Press & Son Ltd	xiii
Pyrene Co Ltd	May
John Rabone & Sons Ltd	May
Serck Radiators Ltd	Inside Front Cover
Shell-Mex & B.P. Ltd	viii
Shell Chemical Co Ltd	v
Simmons & Hawker Ltd	May
Peter Spence & Sons Ltd	May
Stewarts and Lloyds Ltd	xvii
Stothert & Pitt Ltd	—
Taylor-Short & Mason Ltd	May
Trent Valve Co Ltd	—
United Steel Companies Ltd, The	xii
C. C. Wakefield & Co Ltd	xviii
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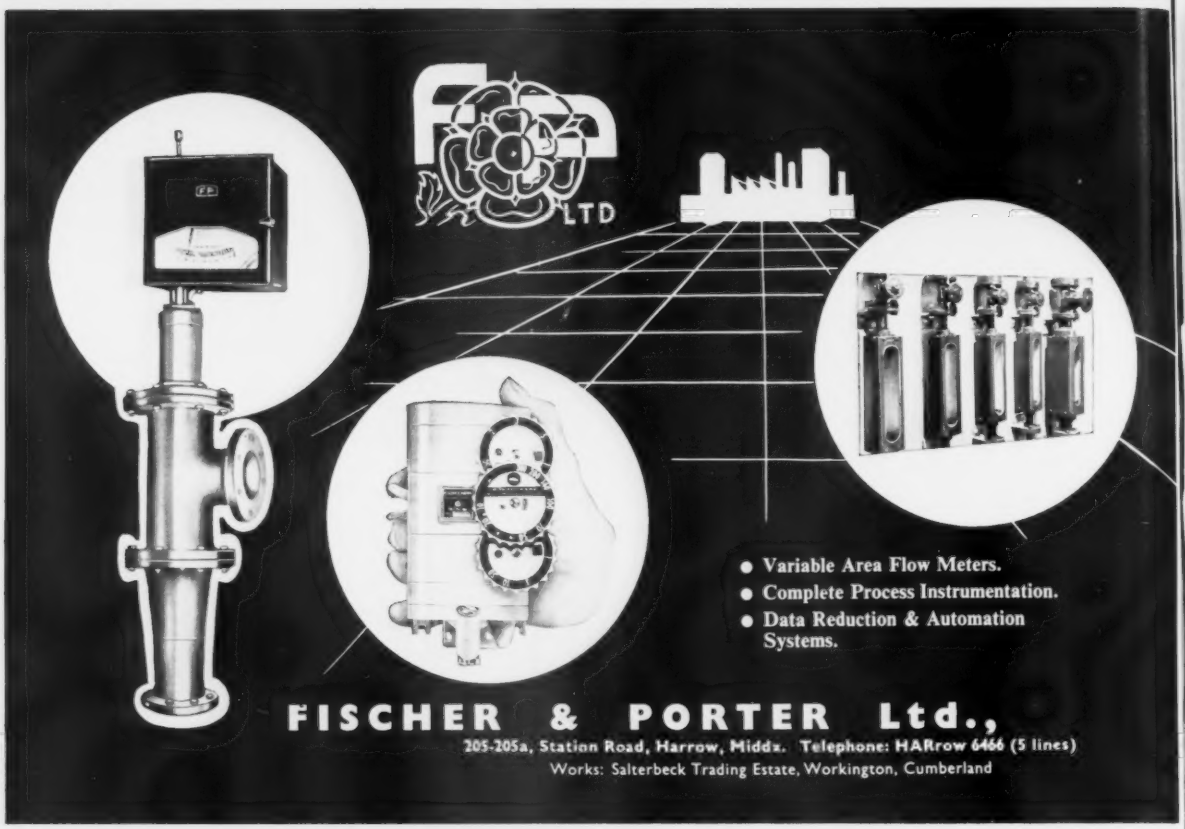
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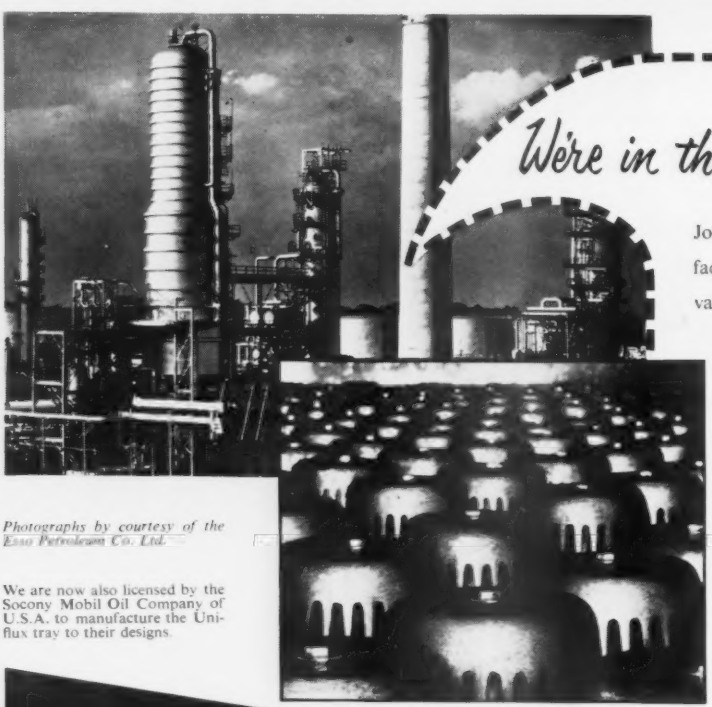

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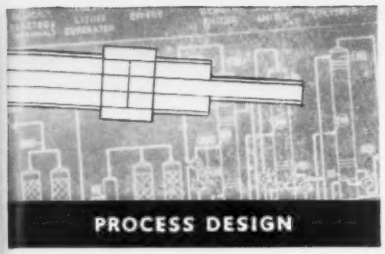

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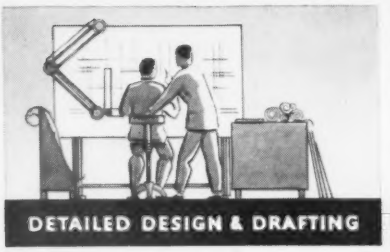

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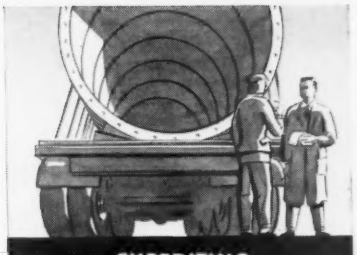

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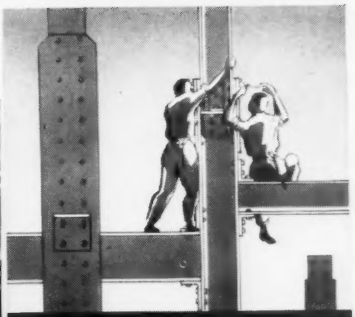

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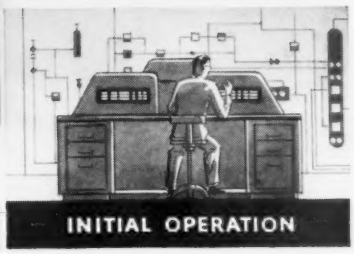

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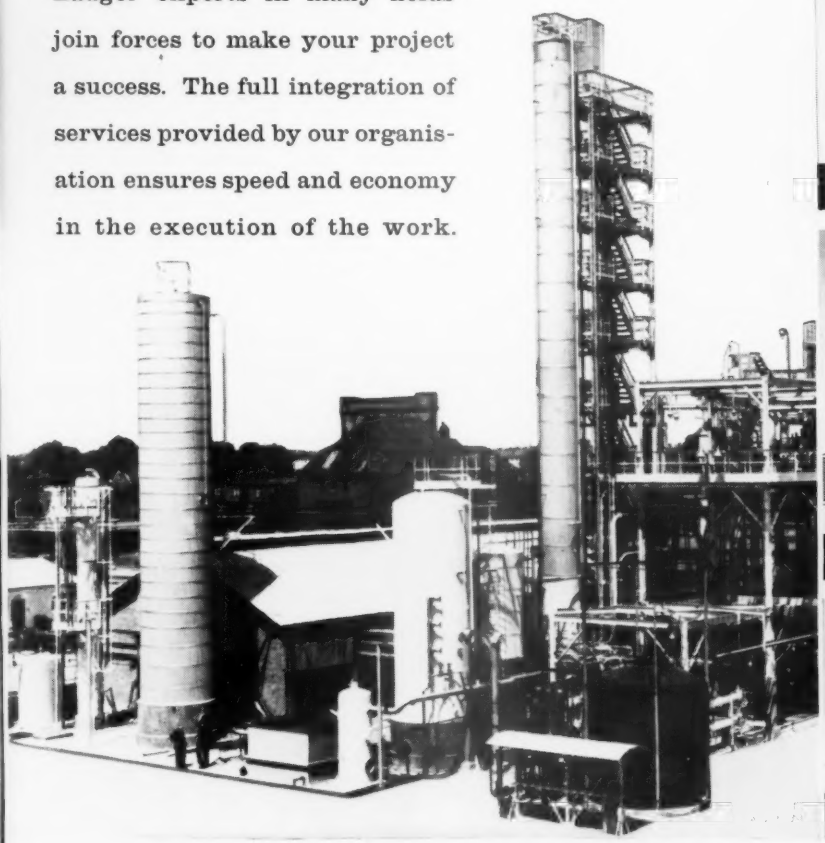

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